Metals Review
THE NEWS DIGEST MAGAZINE
Volume XXV - No. 7 July, 1952

ASM 7th metallographic exhibit

Entries are invited in the 7th Metallographic Exhibit, to be held during the National Metal Exposition in Philadelphia the week of Oct. 20 through 24, 1952. Entries will be displayed to good advantage and awards will be given for the best micrographs as decided by a competent committee of judges.

CLASSIFICATION OF MICROS

1. Toolsteels and tool alloys
2. Stainless and heat resisting steels
3. Other steels and irons
4. Aluminum, magnesium, beryllium, titanium and their alloys
5. Copper, zinc, lead, nickel and their alloys
6. Metals and alloys not otherwise classified
7. Series showing transitions or changes during processing
8. Surface phenomena
9. Results by unconventional techniques (other than electron micrographs)
10. Slags, oxides and inclusions

RULES FOR ENTRANTS

Work which has appeared in previous metallographic exhibits held by the American Society for Metals is unacceptable. Photographic prints shall be mounted on stiff cardboard of maximum dimensions approximating 15 by 22 in. (14 by 18 in. for entries from outside U. S. A.). Heavy, solid frames are not permissible because of difficulties in mounting the exhibit. Entries should carry a label giving:

Name of metallographer
Classification of entry
Material, etchant, magnification
Any special information as desired

Transparencies or other items to be viewed by transmitted light must be mounted on light-tight boxes wired for plugging into lighting circuit, and built so they can be fixed to the wall.

Exhibits must be delivered between Sept. 25 and Oct. 15, 1952, either by prepaid express, registered parcel post or first class letter mail.

Address: Metallographic Exhibit
Metal Exposition
Convention Halls
Philadelphia 4, Pa.

AWARDS AND OTHER INFORMATION

A committee of judges will be appointed by the Metal Congress management which will award a First Prize (a medal and blue ribbon) to the best in each classification. Honorable Mentions will also be awarded (with appropriate medals) to other photographs which, in the opinion of the judges, closely approach the winner in excellence.

A Grand Prize, in the form of an engrossed certificate, and a money award of $100 will be awarded the exhibitor whose work is adjudged best in the show, and his exhibit shall become the property of the American Society for Metals for preservation and display in the Society's headquarters.

All other exhibits will be returned to owners by prepaid express or registered parcel post during the week of Oct. 27, 1952.

Entrants living outside the U. S. A. will do well to send their micrographs by first-class letter mail endorsed "May be opened for customs inspection before delivery to addressee".

A "Student Competition" will also be made part of the exhibit, as in the past few years. Rules for entries in the Student Division were published in the February and March issues of Metals Review.

34th National Metal Congress and Exposition

Philadelphia, Pa. **October 20 to 24, 1952**

Metals Review

THE NEWS DIGEST MAGAZINE

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ASM REVIEW OF METAL LITERATURE

Philadelphi

A City

The Liberty Bell—Symbol of American Freedom

Industry Shares Prominence With Culture and Art in Philadelphia's History

A city of paradoxes and surprises, Philadelphia might appear to the casual visitor to be old and unprogressive, a mixture of Revolutionary relics set among pushbutton gadgets. Both the history and progress of the city belie this appearance. Philadelphia is a vast conglomerate of the old and the new. It is the city where the first suspension bridge and the television were born, the center of the radio industry, birthplace of streamlined trains, and producer of an atomic bomb element. Its patched cobblestone streets contrast strangely with its skyscrapers. These incongruities are only a part of its over-all charm.

Philadelphia is a city of "firsts". It was the first capital of the United States, the site of the first public school, the first library, and the first university in the country. The first exhibition of American manufacturers was held in Philadelphia in 1824. Benjamin Franklin "discovered" electricity here in 1832. So diversified is its industrial life today that it is known as the "workshop of the world". Over 300 innovations in the development of industry, science, medicine, and culture started in this city, a city still gracious with green parks, a city where you can look down from the windows of business offices upon an Indian reservation, dedicated forever as a camping ground for Indians to hold pow-wows.

Almost from the beginning Philadelphia was marked for a great industrial future. Bricks and crude pottery were among its first manufactured products. A paper mill followed soon after, and the first printing plant in America opened in Philadelphia in 1685. Of all types of manufacturing in the U. S. today, 79% may be found here.

The city has long been recognized as a center of many industries. The hat-making companies, drug producers, locomotives, textiles and other lines of manufacture in Philadelphia are world famous. These industries contribute to part of everyone's daily living. Clothing, automobile bodies, street cars, books, trains, television sets, the radio in your home, were probably made here. From pins to planes, soap to ships, from containers to chemicals, Philadelphia's 5408 industries are continuously busy manufacturing articles for your benefit and convenience. The money in your pocket may have been made in the United States Mint here. The sugar in your coffee, the salt on

(*Continued on p. 6*)

Spacious Benjamin Franklin Parkway Looking Toward City Hall From the Art Museum (Courtesy Philadelphia Convention and Visitors Bureau)

Philadelphia

(Continued from p. 5)

your eggs, your rugs and furniture, the gas and oil in your car, the container your merchandise is delivered in, the medicine your doctor prescribes, all of these help to constitute Philadelphia's $3,000,000,000 annual industrial output, and make it the third largest city in the United States in number of establishments, number of wage earners, and amount of wages paid. Philadelphia's retail sales exceed $2,500,000,000 annually.

When water was the principal artery of commerce, the Philadelphia port stimulated the industrial development of the city, the area and the State. This, with the opportunity of free economic enterprise which William Penn provided along with religious freedom, spurred incentive.

Philadelphia's port is the second largest in the United States in spite of its distance from the ocean. Close to this inland port on the Delaware River, which services the highest concentration of manufacturing power and variety in the world, are found most of the nation's importers and exporters. It is the only port where ocean-going vessels can tie up alongside the piers and be loaded with the manufactured goods the city produces, directly from trucks and railroad cars, saving time, double handling and expense.

Geographically, the county of 130 sq. miles which evolved from the original 2 sq. miles settled by the Dutch, Swedes and English, is one of the smallest in the nation, but it produces a greater value of manufactured articles than any one of 40 states, and more than the combined value of production of 17 states.

Today Philadelphia is in the midst of a $302,000,000 municipal improvement program, having its eye on the future, but always carrying with it the best of its heritage from an inspiring past.

York Chapter Hears How Microscope Can Solve Production Problems

Reported by C. A. Sloat

Associate Professor of Chemistry Gettysburg College

Robert M. Brick, director of the department of metallurgical engineering, University of Pennsylvania, presented a lecture entitled "Quick Watson, the Micro!" at the April meeting of the York Chapter.

Dr. Brick compared the metallurgist to a detective. He stated that the basic tool of the metallurgist is the microscope and that a metallurgist ought to be able to reason logically on the basis of what he sees under the microscope. Seven examples where the microscope was used successfully to solve actual production problems and service failures were presented, and one type, fatigue failures, in which the microscope frequently did not help.

The following examples were presented by means of slides.

Fatigue failures—The use of the microscope gives negative results 60% of the time.

Defective high-carbon toolsteel—The microscope showed FeO rolled in from a seam; also carbide envelopes.

High-alloy steels containing 7% chromium and 7% tungsten—The microscope showed excessive growth when used in a die. It also revealed retained austenite caused by too high an austenization temperature and insufficient cooling before the final tempering operations.

A specimen of Rockwell C60 hardness or better—The microcope showed the initiation of a crack from the vicinity of an electric stencil mark, and also local austenization. The thermal and transformation stresses initiated the crack.

Electric generator shafts of 4340 steel, heat treated to a hardness of C30 that failed in service—The microscope showed that keyways in the ends of the shafts had been overmachined and that two passes of weld metal had been put in and the key way remachined. Welding without preheating caused underbead cracking.

Nitrided specimens where the nitrided cases kept spalling off—The microscope showed that the cracks followed grain boundaries of a decarburized columnar structure.

24ST Alclad subjected to fatigue stressing for a long time with a load just under the endurance limit—The specimen showed greatly increased vibrational damping. The microscope showed the reason for the damping was a lot of shear cracks in the surface of the Alclad. Energy was absorbed by internal rubbing.

Brittle fracture of low-carbon carburized steel used as teeth in a raking operation which involved abrasion—The microscope showed a mixture of ferrite and martensite, resulting from heating to within the critical zone and quenching.

100 Milwaukee Members Visit Chicago Plants

Waiting for Their Buses Are the 100 Members of the Milwaukee Chapter Who Visited the Lindberg Engineering Co., and the Lindberg Steel Treating Co., Chicago, on May 23. The guests, who came on chartered buses, were met by Lindberg engineers at the city limits and escorted through city traffic by motorcycle policemen. They visited the steel treating plant in the morning and spent the afternoon at the engineering plant

METAL SHOW NEWS
Dateline: Philadelphia, Oct. 20-24

A month-by-month preview of the National Metal Congress and Exposition

JULY—They'll come by the thousands—from near and far—these metals engineers, designers, fabricators—they'll come because the Metal Show is the world-wide roundup of everything that is new—different—improved and that will boost production.

To this great marketplace of metals will come scientists, armed with laboratory findings—with proven theories—with far-reaching techniques to set in motion even greater achievements in the metals industries.

To this great marketplace of metals will also come the production chiefs of hundreds of industries—along with their shop superintendents, general managers and top executives. They'll come because they have learned that the cost of missing a big Metal Show is too high—competitively speaking. Too high in keeping abreast of what is new—what is different. Too high in staying close to industry demands and how these demands are being met by manufacturers keenly aware of the growing need for faster and better production.

They'll come to buy. One year ago the doors of the Metal Show had opened only a little while when the first "sold" sign went up over a major metal-finishing unit. Others began to go up and by the evening of the first day exhibit halls were plentifully sprinkled with signs that said business was good. Business stayed good. And those who did not buy at the Show went away with specifications, ideas and quotations that resulted in major purchases months after the Metal Show had closed.

Just as important and just as impressive as the sales was the knowledge and broadening perspective picked up by Show visitors. You can't visit a Metal Show without seeing a new process or a new technique of shaping, forming or fabricating metals faster and better than it has ever been done before—you can't miss new ideas and new horizons that open up big fields of improvement and profit.

Whether your interest lies in metallurgy—in fabricating—in design or production, you'll find attention-stopping, thought-provoking displays featuring some vital bit of progress right down your alley. That's why the big Metal Show has become the metals marketplace of the world—that's why, year-in and year-out, more and more thousands have made it a positive must to be on hand at the inspiring, challenging, stimulating Metal Show!

Matching the scope and spirit of the Metal Show itself will be the size and freshness of the famed Convention Hall and Commercial Museum. Newly decorated, boasting a fine new dispensary and completely new and enlarged rest rooms, this spacious exhibition hall will also boast a brand-new concept of smart, significant decorating. For the first time in any national show, there will be artistry in metals to please and delight everyone who works with metals. Space doesn't permit a full-blown description of what you will see, but it is a safe bet you have never seen anything like it! So keep an eye peeled for proof positive that artists as well as metals engineers can do wonders with metal!

We keep on hearing heartening things about the Metal Show of last year. Most recent spirit-lifter came in the form of a printed piece in which the Tin Research Institute quietly states that the interest generated at the Show paid off handsomely in contacts and new customers. Which proves again that it doesn't make much difference what metal field you serve—what kind of product or process or service you offer the great metals industry—you are bound to get more than your money's worth exhibiting or visiting the big Metal Show—*the metals marketplace of the world!*

C. S.

Ordnance Chief Details Naval Research Program

Reported by J. H. Schaum

Metallurgist
National Bureau of Standards

The guest speaker at the May meeting of the Washington chapter was Rear Admiral Malcolm F. Schoeffel, chief of the Bureau of Ordnance, U. S. Navy. Adm. Schoeffel pointed out a number of changes in armament design which have been devised to save critical materials. One outstanding example is the conversion from brass to steel cartridge cases. A program of substitution of fiberglass-plastic materials for metals is now under way.

The speaker described the Navy's tremendous salvage program, stating that over a million pounds of scrap is being collected at Navy salvage depots every week. As far as the future is concerned, the Navy wants titanium—at a reasonable price, it needs gun barrels made out of heat resistant materials, such as molybdenum, and it has assigned the Office of Naval Research the project of finding a "dream metal" which will satisfy the demands of design engineers.

The newly elected slate of officers of the Chapter was installed at this last meeting of the 1951-52 season. A rare violet-Kingwood gavel was presented to the outgoing chairman, F. M. Reinhart, in appreciation of his excellent services.

The new officers introduced by the toastmaster, O. T. Marzke, included E. L. Olcott, chairman; H. N. Arbuthnot, vice-chairman; M. R. Meyerson, secretary-treasurer; R. S. Wiley, chairman of meetings committee; and H. Bernstein, H. F. Bishop, J. D. Dunbar, N. C. Fick, E. P. Klier, and F. M. Reinhart, executive committeemen. For his services as national trustee, 1950-51, T. G. Digges was awarded a gold medal by the national office.

Phoenix Chapter A. S. M. Holds First Meeting

Reported by W. B. Arness

Engineer, Goodyear Aircraft Corp.

The newly organized Phoenix Chapter held its first meeting on May 13. John T. Kimball, vice-president of Arizona Public Service Co., spoke on "Industrial Potentials in Phoenix for the Metal Crafts" to the 60 members and guests who attended.

The Chapter is formulating plans to initiate an educational series for the 1952-53 term.

Lee Mitchell, program chairman, showed a color film "The Shape of Things to Come" describing the manufacture and uses of aluminum.

Mahoning Valley Chapter Enjoys Plant Visit At Pittsburgh Steel Co.

Reported by E. M. Smith

Development Engineer
Youngstown Sheet & Tube Co.

On May 13th, over 100 members and guests of the Mahoning Valley Chapter visited the Thomas Strip Division of the Pittsburgh Steel Co. at Warren, Ohio. A. E. Gregg, superintendent of the plant, was host for the plant visitation.

The Thomas Steel Co., organized in 1920, took over the Warren property of McMyler Interstate Co., a foundry and machine shop. In 1923 the manufacture of cold rolled strip steel started. In 1928, electroplated cold rolled strip was added, and subsequently, other coatings. The Pittsburgh Steel Co. acquired the property in 1951. The present plant facilities are capable of producing 95,000 tons of steel a year and the plant employs approximately 1000 people.

The visitors were shown almost every department during their 3-hr. visit. Included in the processes seen were:

Rolling of light gage precision strip steel ⅛ to 23 in. wide, 3/16 to 0.002 in. thick (a newspaper is about 0.003 in. thick); electrocoating with zinc, copper, nickel, brass and lead alloys; continuous hot dip coating with tin and lead alloys; continuous lacquer coating of plain and plated strip; laboratories, air-conditoned and ultra-modern in interior appointments and equipment; and annealing facilities, both batch and continuous.

Columbia Basin Chapter Sponsors Student Night

Reported by R. B. Socky

Metallurgist, General Electric Co.

With the determination to rectify the increasing shortage of qualified engineers and engineers-in-training caused by decreased enrollment in engineering schools, the Columbia Basin Chapter held its first annual students night on May 6.

The facilities of the Hanford Works School of Nuclear Engineering, the services of the school's director, D. W. McLenegan, four industry-prepared educational films, and the cooperation of the student counselor and teachers of Columbia High School were incorporated in a program designed to interest senior high-school students in the opportunities in the engineering profession.

The meeting opened with several timely remarks by G. L. Flint, chapter chairman. Continuity was achieved by immediately showing the semi-technical movies, followed by a brief talk by Dr. McLenegan. The films shown were:

"A Hidden World", the pictorial description of the engineering profession (Allis-Chalmers Manufacturing Co.); "Life of Thomas A. Edison" (General Electric Co.); "Backbone of Progress", the role of steel in our modern age (American Institute for Steel Construction); and "This is Steel", the manufacture of steel from iron ore (Bethlehem Steel Co.).

Dr. McLenegan's talk was followed by a question and answer period. The meeting was kept on an informal basis, and was closed with the serving of refreshments. It was attended by 15 members, 25 teachers, students and interested persons.

Compliments

To BRADLEY STOUGHTON, director and consulting metallurgist of Lukens Steel Co., and past president of the American Society for Metals, on his receipt of an Army award for his contribution to the World War II effort in industrial intelligence. The award was made at a special ceremony at Lehigh University. Mr. Stoughton served as London representative of the Technical Industrial Intelligence Committee, which worked closely with the Joint Chiefs of Staff during the last war.

♦ ♦ ♦

To POL DUWEZ on his promotion to the rank of professor of mechanical engineering at the California Institute of Technology.

♦ ♦ ♦

To the following A.S.M. members who have recently been elected officers of the American Society for Testing Materials: H. L. MAXWELL, president; N. L. MOCHEL, vice-president; G. R. GOHN, and A. O. SCHAEFER, directors. Mr. Schaefer is a nominee for A.S.M. trustee for the 1952-53 term.

♦ ♦ ♦

To WILLIAM H. WORRILOW, SR., president of Lebanon Steel Foundry, on his dedication speech made at the opening of an international library devoted to the history of iron and steel in Schauffhausen, Switzerland. He is a representative on an international committee which will supervise the library.

♦ ♦ ♦

To M. E. MERCHANT, senior research physicist, Cincinnati Milling Machine Co., on his election to president of the American Society of Lubrication Engineers.

♦ ♦ ♦

To ROBERT F. MEHL, head of the department of metallurgical engineering at Carnegie Institute of Technology, who delivered the commencement address at the Colorado School of Mines 78th annual exercises May 29. In his talk he stressed the need for research in the fields of geology, prospecting and metallurgy.

To PAUL D. MERICA on his election to president of International Nickel Co. of Canada, Ltd., and its U. S. subsidiary, International Nickel Co., Inc. He has been a director of the parent company since 1934, and executive vice-president since 1949. Dr. Merica received the A.S.M. Gold Medal in 1951 in recognition of his "outstanding metallurgical knowledge and exceptional ability in the diagnosis and solution of diversified metallurgical problems".

♦ ♦ ♦

To W. H. "BILL" WHITE on his election to general manager of the Amalgamated Steel Corp., Cleveland.

♦ ♦ ♦

To FRANK B. RACKLEY on the write-up he received in the April 5th issue of *Collier's* Magazine, entitled "Young Man of Steel". The article explains how he took over as executive vice-president of the Jessop Steel Co., and turned it from a debt-ridden steel mill into a money-maker.

♦ ♦ ♦

To the COLLEGE OF ENGINEERING, New York University under the direction of HAROLD K. WORK, research division, on being listed as one of the first eight of 200 educational institutions which do more than half of the total defense research in electronics.

♦ ♦ ♦

To F. GUY WHITE, technical director of Granite City Steel Co., on receiving the Galvanizers' Committee third annual award for outstanding contributions to the industry. Mr. White was named chairman of the American Conferees, Study Group 11 (Galvanizing), at the World Metallurgical Congress last October. He is a charter member and past chairman of the St. Louis Chapter A.S.M.

♦ ♦ ♦

To BENJAMIN F. FAIRLESS on his recent election to chairman of the board of United States Steel Co., and on being selected by the John Fritz Medal Board of Award to receive the 1953 John Fritz Metal and Certificate as "Champion of the American Free Enterprise System for Notable Industrial Achievement in the Production of Steel".

♦ ♦ ♦

To JOHN S. MARSH, research engineer of the Bethlehem Steel Co., on being awarded the American Iron and Steel Institute Medal in May. The award is given annually for a paper of special merit in connection with the activities of the iron and steel industry. Mr. Marsh's paper was on the "Significance of Air Temperature in Openhearth Operation".

♦ ♦ ♦

To L. F. REINARTZ, vice-president of Armco Steel Corp., on being awarded the Regional Technical Meeting Award of the American Iron and Steel Institute in May. The award is given for a paper of outstanding merit in regional programs. Mr. Reinartz's paper was on "A New Departure in Steel Production".

Milwaukee-Student Guests Hear Jaffe

(At Left) Leonard D. Jaffe (Center), Chief of Physical Metallurgy Branch, Ferrous Metallurgy Laboratory, Army Ordnance Corps, Discusses His Talk "Brittle Failures in Steels" With Ralph Webb, Executive Committee, Milwaukee Chapter, and Phillip C. Rosenthal, University of Wisconsin. (Below) Group of students from the University of Wisconsin and Marquette University who were guests of the Chapter in April

Reported by Donald R. Mathews

Assistant Metallurgist
Allen-Bradley Co.

Leonard D. Jaffe, chief of the physical metallurgy branch, ferrous metallurgy laboratory of the Army Ordnance Corps, Watertown Arsenal, gave a technical discourse on "Brittle Failure in Steel" at the April Meeting of the Milwaukee Chapter.

The talk centered on failures involving comparatively few cycles of loading rather than the fatigue-type failure. Normal ductility tests often give no indication. The greater the tensile stresses are in a loading cycle, the more brittle will be the reaction, while the opposite is true if compressive stresses predominate. A notch introduces more tensile stresses and increases the stress rate, thus the part reacts in a more brittle manner. Notched test specimens are used to get transition temperatures around room temperature.

Tempered martensitic steels have a lower transition temperature (corresponding to decreased brittleness) than those with bainite or pearlite. However, at low strength levels, tempered bainite and pearlite are not objectionable. Overheating must be avoided.

Dr. Jaffe discussed temper brittleness and mentioned that holding time to a minimum and quenching after tempering help to minimize the effect. Molybdenum up to 0.5% retards temper brittleness. Phosphorus must be kept low and small grain size is beneficial.

High carbon steels are more brittle than low carbon, and nitrogen should be low. Low phosphorus, sulphur and silicon also result in improvement.

The Chapter played host to 25 students from the University of Wisconsin and Marquette University.

Almen Explains Fatigue Losses and Gains by Electroplating Processes

Reported by E. W. Lovering

Metallurgist, Seymour Mfg. Co.

Over 100 members of the New Haven Chapter met on May 15 to hear J. O. Almen, technical consultant of the research laboratory division of General Motors Corp., speak on "Fatigue—Loss and Gain by Electroplating."

Mr. Almen showed how early work had indicated that nickel plating was responsible for a 50% loss of fatigue strength of steel. As an example, nickel has a fatigue strength of 35,000 psi., steel 33,000 psi., but nickel plated steel dropped to 20,000 psi.

The softer metals such as cadmium, copper, zinc, and lead do not cause this loss but nickel and chromium have a pronounced effect. For instance, a crankshaft had a fatigue strength of 11 tons per sq. in. but dropped to 6½ tons per sq. in. when chromium plated.

It was reasoned that this must be caused by a residual tensile stress in the plating. This in turn caused the plating to crack and much stress was then transferred locally to the base metal, thus lowering its fatigue strength. An experimental technique was developed to plate specimens under controlled conditions, and measure the nature of residual stress in the electrodeposited coating.

It was found experimentally that plating conditions in electrodepositing nickel have a profound effect on the nature and amount of residual stress in the plate. The residual stress could be raised from 5000 psi. tension to 43,000 psi. tension in a Watts bath by changing such basic variables as temperature, pH, and current density. With proprietary bright nickel baths, residual stress could be raised all the way from a compression stress of 9000 psi. to a tensile stress of 70,000 psi. From these experiments, a method of nickel plating was developed which insured a compressive residual stress. With such a stress the fatigue strength of a plated metal can actually exceed its unplated fatigue strength.

Chromium cannot now be plated by any procedure to give a residual compressive stress. The stress is always tensile and quite high. In the case of chromium plated parts, shot peening the base metal prior to plating raises the fatigue strength by mechanically inducing a residual compressive stress in the surface layers of the base metal underlying the plated layers. A chromium plated part shot peened prior to plating has even better fatigue strength than the unplated part which has not been shot peened, and has nearly the same strength as an unplated part which has been shot peened.

25-Year Members Hear Gas Turbine Talk

Members of the Canton-Massillon Chapter Who Received 25-Year Certificates at the April Meeting Are, From Left: Virgil W. Whitmer, Republic Steel Corp.; C. H. McCollam, Timken Roller Bearing Co.; D. H. Ruhnke, Republic's Central Alloy Division; R. L. Wilson, Vice-President, A.S.M.; W. M. Farnsworth and E. R. Johnson, Republic Steel Corp.; J. E. Fick, Representing Timken's Library Membership; and B. H. Miller, Timken Roller Bearing Co. (Photograph by E. B. Hert)

Reported by Wells E. Ellis
Research Metallurgist
Timken Roller Bearing Co.

H. H. Hanink of the Curtiss-Wright Corp., Wright Aeronautical Division, Wood-Ridge, N. J., discussed the various metallurgical aspects of turboprop and turbojet gas turbine engines before the April meeting of the Canton-Massillon Chapter.

The subject of his talk was "Aircraft Gas Turbine Metallurgy as Related to Engine Design". Mr. Hanink presented the materials problem by comparing engine requirements for three turbojet engine types: (*a*) a typical service model, (*b*) advanced production models, and (*c*) advanced development models. Stress and temperature conditions were compared in a slide showing an engine cycle analysis for pressure and temperature in each of the three models. Pressure was shown as increasing through the compressor stage, reaching an almost constant level in the combustion chamber, and decreasing through the turbine stages. Gas temperature increased gradually through the compressor stage, then rose abruptly, reaching a peak at the inlet of the turbine stage.

Magnesium and aluminum-base alloys are used from the front main bearing support through the compressor in present models at operating temperatures of from 300 to 500° F. A change to ferrous materials may be necessary in advanced models where gas temperatures may reach 800° F., or higher, at the compressor exit. Gas temperatures of 1400 to 1600° F. are produced ahead of the turbine stages where such materials as nickel and cobalt-base alloys are used for rotor and stator blades, Timken 16-25-6 for composite disk rims, and Timken 17-22A and Discalloy types for turbine disks.

The speaker claimed that the largest reductions in strategic materials would eventually be realized through improvements in turbine and compressor components. The Junkers Jumo 004 engine of German origin was cited as a prime example of designing for strategic alloy conservation.

Turboprop and turbojet engines were compared on the basis of propulsive efficiency at various speeds. The turboprop efficiency is greater than that of the turbojet engine at speeds up to about 500 miles per hr., where both engines approach equal efficiencies. The reverse is true for higher speeds, although drag effects and airframe design become limiting factors. As a result, higher combustion chamber temperatures should show greatest returns in fuel economy in engines of the turboprop type, and should thus stimulate efforts to provide these engines with turbine blade materials for use for above 1600° F.

The talk was concluded with the showing of a sound movie in color depicting the redesign of the front main bearing support for the Sapphire engine in the Wright Aeronautical Laboratories. This project reduced the cost of the assembly by a factor of 10 to 1.

C. L. Clark, metallurgical engineer, special steel development, Timken Roller Bearing Co., served as technical chairman for the meeting.

A.S.M. Student-Teacher Awards Program Announced by Secretary

More engineers and scientists for industrial production is the goal of the American Society for Metals' $5000 student-teacher awards program for 1952.

Launched this year in over 16,000 schools, the Society's awards program is timed to help bring the country's scientific and engineering personnel into a reasonable balance with the critical needs now building up for the period some years hence.

Administration of the program details and the judging of entries is being handled by the National Science Teachers Assoc., Washington, D. C.

Since May 30, the closing date, NSTA reports that hundreds of entries have been processed for judging. Presentation of cash and certificate awards will be announced later this year.

A total of 80 awards in Defense Bonds and certificate awards will go to four classifications of students, teachers and schools, as follows:

To students of grades 7 to 10: four first place awards of $100; eight second place awards of $50; ten honorable mention awards of $25.

To students of grades 11 and 12: four first place awards of $200; four second place awards of $100; and ten honorable mention awards of $50.

To junior and senior high teachers: twenty cash awards of $50 each.

Awards to schools: to science departments of schools whose students have won first and second place awards, eight first-place awards of $100, 12 second place awards of $50.

W. H. Eisenman, national secretary of A.S.M., pointed out that the program is not based on the so-called "essay" contest, but rather upon the student's accomplishments or experimentation in the sciences.

The awards to science teachers are designed to stimulate greater interest in science teaching, and as a result of this increased interest, a closer supervision of student activity and greater attention to the ultimate usefulness of classroom and laboratory work.

In this awards program, we are primarily interested in supporting an all-out effort to maintain this country's leadership in science, engineering and technology, Mr. Eisenman explained.

While this Society's principal interest is metals, the metals industry (production and fabrication) is the largest employer of engineering talent and is directly concerned with the development of greater interest in engineering in order to properly support the industry's efforts.

By cooperating with the NSTA, we can reach the country's youth with the facts and the importance of careers, science and engineering as careers, thus establishing genuine interest and a decision to study science at an early and effective age.

Ten Years Ago

Quotes From *Metals Review* June 1942

"At the suggestion of the War Production Board, the War Products Advisory Committees of the A.S.M. will act as local clearing house for information relative to the new National Emergency Steels (NE series) received by the Board at Washington."

"Lindberg Engineering Co. of Chicago has announced the opening of a new office in Milwaukee. ROBERT C. ONAN, formerly advertising manager of the firm, has been appointed district sales manager."

Describes U. S. Steel's Fairless Works

The history and present status of the new Fairless Works of the United States Steel Co. in Morrisville, Pa., were described by C. F. Hood, executive vice-president of operations, in an illustrated talk at the Young Fellows Night meeting of the Pittsburgh Chapter on April 10.

After preliminary discussion of how this new plant, and other expansion projects now underway, are indicative of the steel industry's faith in America, and the initiative and drive of private enterprise, Mr. Hood described the genesis of the idea of locating a plant on the eastern seaboard. The invasion of Korea, highlighted by communist pressure in foreign countries, was a factor that convinced the management of United States Steel in 1950 that prompt attention should be given to all of its plans for increasing steel facilities for national defense.

Considerations leading to the decision to locate the plant at its present site were its proximity to tidewater, which makes it possible to receive bulk shipments of iron ore and coal by ocean-going carriers, as well as manganese, fuel oil, and other supplies. Additional factors were an abundance of fresh water, a labor market, good railroad facilities, availability of supplies, and perhaps most important, a need in the general area for the diversified products which the mill will produce. Today, a little more than a year after construction work was begun, completion of the Fairless Works is close to the half-way mark. Production of coke and pig iron will begin at the plant within a few months, and before the end of this year, a variety of finished steel products will be arriving at the plants of East Coast consumers.

C. F. Hood (Left) Who Presented the History and Present Status of United States Steel Co.'s New Fairless Works, Is Shown With L. A. Rodecker, Chairman of Young Fellows' Night, Which was Held at the April Meeting of the Pittsburgh Chapter

Considerable thought had to be given to those matters of steel mill operation which are of vital concern to the residents of the area surrounding the plant, such as smoke control and avoiding water pollution. In the matter of housing, the company cooperated with one of the nation's leading realtors in building Fairless Hills, a completely new community.

It has been estimated that total time spent on engineering during the planning stages alone, as related to the actual construction of the plant, would amount to more than 3000 man-years. More than 30,000 carloads of materials will go into building the plant and equipment.

Fairless Works will be a fully integrated steel mill. This involves the erection of by-product coke ovens, blast furnaces and auxiliary equipment, openhearth furnaces, and finishing facilities for hot and cold rolled sheets, bar mill and tin mill products, as well as standard steel pipe. The planning of the plant also involved extensive maintenance and service facilities — railroads, roadways, sewage, electric power equipment, water purification, and pumping stations.

When Fairless Works is in operation it will use enough raw materials annually to fill a train of hopper cars stretching from Pittsburgh to Portland, Maine and back again—some 1300 miles. At peak operation it will require enough electric power to supply the electrical needs of a city the size of Newark, N. J.

Mr. Hood closed his talk by emphasizing the effectiveness of the private enterprise system which has resulted in a vast, dependable industrial system here in America.

St. Louis Hears Talk On Gas Carburizing And Carbonitriding

Reported by L. P. Wilson

Chief Metallurgist
U. S. Defense Corp.

The St. Louis Chapter enjoyed a talk by Orville E. Cullen, chief metallurgist for Surface Combustion Corp., on "Gas Carburizing and Carbonitriding," at the May meeting. Many practical applications were discussed and illustrated with slides by Mr. Cullen. Gas atmospheres for use in neutral hardening, carbon restoration, carbonitriding and gas carburizing were described.

Dry cyaniding or carbonitriding is usually done at 1450 to 1550°F. Case hardening benefits of nitrogen are lessened above 650°F.

Nitrogen, to be effective in hardening, must come from a source of nascent nitrogen such as anhydrous ammonia.

Two types of gas are most common; natural gas, which gives enough hydrogen plus hydrocarbons for carburizing, and carrier gas, which is used to control the amount of carburizing gas by using the former as a diluent for the natural gas. Endothermic gas, as a diluent, serves to adjust the ratio of carbon monoxide, hydrogen, and nitrogen in carburizing and other carbon controlled atmospheres. Carbon dioxide plus water vapor control is based on the dew point determination and serves as a carbon concentration control.

In closing, Mr. Cullen showed how furnace design plays an important part in preventing contamination of the furnace atmosphere. With improper design, contamination of gases might ruin the work.

An Englishman Views U. S. Metallurgical Education

An interesting article "Some Impressions of Metallurgical Education in the U.S.A.", written by K. M. Entwistle, of the metallurgy department of the Victoria University of Manchester, England, appeared in the January 1952 issue of *Metallurgia.* Mr. Entwistle was a conferee in Study Group 8 (Metallurgical Education) which toured American institutions providing metallurgical training during the World Metallurgical Congress last year.

Speaks on Boron

E. R. Johnson, Republic Steel Corp., Spoke on "Alternate Steels" Before the February Meeting of the Los Angeles Chapter. He emphasized the increasing importance of alternate steels due to the relative scarcity of alloys needed for military and civilian demands. He covered the effect of boron as an alloying element with respect to hardenability and physical characteristics, and compared alternate boron steels with steels which have been used in the past

Kinzel Delivers Annual Sauveur Lecture

A. B. Kinzel (Left), Lecturer at the Annual Sauveur Night of the Philadelphia Chapter, Discusses His Talk "Trends in Metallography" With Russ McCarron, Chapter Chairman, and John W. Streeter, Assistant Director of the Fels Planetarium of the Franklin Institute in Philadelphia

Reported by
Chas. W. Alexander, 3rd

Metallurgist
Henry Disston & Sons, Inc.

The 19th Annual Sauveur Night of the Philadelphia Chapter was held at the Franklin Institute. The lecture, on "Trends in Metallography", was delivered by A. B. Kinzel, president of the Union Carbide and Carbon Research Laboratories, Inc.

Dr. Albert Sauveur thought of himself primarily as a metallographer, Dr. Kinzel stated. Thus, metallography is a most fitting subject for a lecture honoring him. The great strides in the development of this science in recent years were stressed by the speaker.

Phase interference microscopy, and the use of optical flats in the study of contours were developed. The use of the reflecting microscope in the study of metals at elevated temperatures, development of new polishing agents and techniques, and color photography, coupled with polarized light to identify inclusions, were also discussed.

In closing, Dr. Kinzel stated that metallurgists should not be satisfied with present developments in their field, but should seek advanced techniques to broaden their present state of knowledge.

A planetarium demonstration by John W. Streeter, assistant director of Fels Planetarium of the Franklin Institute, preceded Dr. Kinzel's talk. He discussed the stars, their densities, and their temperatures, as determined with the spectroscope.

Describes "Growing Pains" In Titanium Technology

Reported by John P. Nielsen
New York University

"Titanium is this year beginning regular production in parts of both airframes and jet engines, and a sound titanium industry is being established". This was the opening statement of Walter L. Finlay, research manager of Rem-Cru Titanium Corp., in his address on the subject of "Titanium Today" before the New York Chapter.

Touching only very lightly on the well-publicized glamour aspects of titanium, the speaker documented this significant milestone with the annual production figures, and photographs representative of those items now starting in production.

The total annual tonnage of titanium metal was given as 2.5 for 1948, 75 for 1950, 700 for 1951, and an estimated 2000 for 1952. This growth is much greater than that of any other metal or alloy, including stainless steel, magnesium, and aluminum. Reason? The Defense Department's interest in titanium's outstanding combinations of lightness, strength, ductility, and corrosion resistance. This has manifested itself in solid support from the armed forces, not only in utilization, but also in sponsoring much-needed research and development.

Growth has not been even faster because, from the producers' standpoint, the technology of titanium winning and processing is complex and costly, and vulnerable to obsolescence by the discovery of better methods. From the consumers' standpoint, growth has been slowed because of the high cost of titanium, varying from $12 to $25 per lb. It was estimated that when production reached several thousand tons annually, the cost of raw metal would drop to $1.50 to $2.50 per lb., the cost of simple fabricated forms of the metal to $3.50 to $6.00 per lb.

Three chief fields of present and potential utilization were mentioned. The first was airplane frames (shrouds, firewalls, and other parts heated by the engine and its exhaust gases), and jet engines (principally compressor blades, stators, and rotors). The second was ordnance material, particularly man and airborne. The third comprised corrosion-resistant applications, such as condenser tubing.

In conclusion, the speaker remarked that although "the middleweight champion of the structural metals" is an apt description for titanium, nevertheless it is still very much in the novice class. It is subject to growing pains, and requires careful handling by all concerned to fulfill its early promise. Given such handling, however, titanium is sure to make significant contributions to the country, both in war and peace.

Describes Commercial Importance of the Less Familiar Metals

Reported by Marvin E. Hansell
Rose Polytechnical Institute

The availability, production processes, properties, alloys, cost and uses of 20 "Less Familiar Metals of Commercial Importance" were reviewed by Robert A. Lubker, associate chairman of metals research, Armour Research Foundation, Chicago, before members of the Terre Haute Chapter in April.

Robert A. Lubker

Mr. Lubker discussed several of the elements which are relatively uncommon, but are of appreciable or potential industrial importance, such as lithium, sodium, titanium, beryllium, calcium, boron and several others.

Although many of the less familiar metals are used only as alloying additives, they are essential in giving alloys such desired characteristics as increased hardness, improved corrosion resistance, and special electrical properties. These metals are uncommon, either because they are present in very small amounts in nature, because their uses have heretofore been limited, or because of difficult production problems.

Titanium appears to be potentially the most important of these metals, according to Mr. Lubker. Titanium alloys now under development should find widespread use in applications requiring a combination of high strength and light weight, such as in aircraft and airborne equipment, and applications involving service up to about 1000° F., as in engine parts.

Day Discusses Control Of Hardenability at Indianapolis Chapter

Reported by George F. Sommer
Metallurgist, Link-Belt Co.

"Hardenability Control and Its Application" was discussed at the April Meeting of the Indianapolis Chapter by Maurice J. Day, assistant metallugical engineer for alloy steels, United States Steel Co.

Dr. Day began his talk with a discussion of the Jominy test for hardenability, and showed slides relating Jominy results to microstructure and size of parts. He showed how hardenability bands were established, and how the steel companies sacrificed a 7% hardenability risk for easing the chemistry restrictions on hardenability steels. T-T-T curves were used to illustrate the changes in microstructure occurring with various cooling rates, and these changes were correlated with actual parts. Dr. Day used standard 50% martensite as a criterion.

The speaker showed how normalizing is used to break up carbide aggregates in a steel prior to the hardening quench. Annealing is used to produce a soft, readily machinable steel, although the phenomenon of loss of toughness because of coarser pearlite is sometimes encountered.

He also discussed isothermal annealing and showed microstructures of a 4815 steel transformed at 1075° F. with resulting high nickel banding throughout the ferrite. Austempering of small sections was compared to conventional quenching and tempering practice.

A series of slides showed the loss of mechanical properties in quenched and tempered steels as percent upper banite increased and percent martensite decreased. The role of tempering temperature in this effect was also illustrated.

Test data showed how higher carbon caused higher tensile strength with a loss in toughness. The effect of carbon on hardenability apparently reaches a maximum at about eutectic composition. Instances were shown where in treating chromium steels the quench temperature was varied to control hardenability. Of considerable current interest to the group was Dr. Day's discussion of the hardenability of boron steels. He showed slides indicating only a minor effect of the boron as the carbon content exceeded 0.75%. This was illustrated in both chromium-boron and chromium-molybdenum-boron steels.

Course on Metal Machining Reported Successful by Columbus

Reported by Paul S. Maynard
Engineering Laboratory
North American Aviation, Inc.

The 1952 educational program of the Columbus Chapter consisted of five lectures on "Metal Machining". The lectures were given by outstanding men in the field.

At the first lecture, given March 20, on "Physics of Metal Cutting and Cutting Fluids", M. E. Merchant, assistant director of research, Cincinnati Milling Machine Co., presented graphic and micro-movie analyses of forces, deformation, chip formation, and the effect of tool shape and cutting fluids on tool life.

The design principles of carbide tools and selection of proper tools for high production rates were discussed in the second lecture, March 27, by W. L. Kennicott, chief engineer, Kennametal, Inc.

The third speaker, J. F. Kahles, Metcut Research Associates, talked on "Evaluating Machinability of Forgings and Castings". He explained how the practical man could use theoretical information to judge machinability. Relationship between microstructure and machinability was explained.

W. H. Splinter, machinability engineer, Republic Steel Corp., who spoke on April 15, showed how the machinability engineer tackles ordinary problems and what factors enter into their solution.

The course was concluded on April 25 by F. W. Boulger, supervising metallurgist in steel processing research, Battelle Memorial Institute, with a discussion of "Possible Solutions to New Problems in Machining". He reviewed the previous talks and explained the reasons for some differences of opinion in the interpretation of machinability. He described newer techniques of machining, such as high-pressure cooling-oil jets, CO_2 as a coolant, and electro-machining.

Comments concerning the series were very favorable, and indicated the interest in this type of course which helps to bridge the gap between the theoretical and practical.

Haswell Staehle, Surface Combustion Corp. was chairman of the educational committee. Average attendance was 155.

Newly Elected Worcester Officers Meet

Worcester Chapter's Final Meeting on April 16 Was Also Ladies' Night and Annual Election of Officers. Pictured are: H. J. Elmendorf, American Steel and Wire Co., elected vice-chairman; J. W. Gulliksen, Worcester Pressed Steel Co., presiding chairman; J. C. Danec, Norton Co., technical chairman; L. G. Shaw, Pratt and Inman, re-elected secretary - treasurer; R. S. Morrow, George F. Blake, Inc., past-chairman and nominating committee chairman; W. J. Johnson, Massachusetts Steel Treating Corp., elected chairman; and Herbert Ueltz, Norton Co., speaker. Dr. Ueltz gave a talk, "All About Glass", and presented a number of experiments. (Reported by C. W. Russell)

New Films

Grits That Grind

The Norton Co. of Worcester, Mass., has completed a new 30-min. film entitled Grits That Grind, picturing the manufacture of abrasives and grinding wheels from the raw materials to the finished products. The company also has eight training films, running from 14 to 26 min., which offer specific information on the following: The Grinding Wheel, Its Care and Use; Grinding Wheel Markings; the Cylindrical Grinder; the Surface Grinder; Cutter Sharpening; Grinding Wheel Safety; the Diamond Wheel, Its Care and Use; and Grinding Carbide Tools. Films are furnished without charge. Three or four weeks advance notice should be allowed when requesting films. Further information may be obtained from the Norton Co., Worcester 6, Mass.

Explains Why Today's Aircraft Demands Utmost From Aluminum Alloys

Reported by C. A. Gorton

Metallurgical Engineer
Hoskins Mfg. Co.

"Aluminum Alloys in Today's Aircraft" was the subject discussed at a joint meeting of the Detroit Chapters A.S.M. and American Institute of Mining and Metallurgical Engineers on April 14. The speaker was E. H. Dix, Jr., assistant director of research, Aluminum Co. of America. His 30 years of experience with Alcoa provided a background for a very interesting discussion.

Mr. Dix pointed out that aluminum is the only common metal for which consumers paid less per pound in 1950 than they did in 1940. This was made possible not only by cost reduction through manufacturing economies, but also as a result of research carried on by Alcoa that increased the physical properties of aluminum alloys.

These improved physical properties have also enabled aircraft designers to step up aircraft performance. In addition, the aluminum industry has kept pace with the ever-increasing demand for aluminum alloy products through rapid expansion of production facilities.

Mr. Dix then described the developments in alloy composition which have provided wrought aluminum alloys today with guaranteed minimum tensile strengths from 60,000 to 80,000 psi, yield strengths from 45,000 to 70,000 psi., and elongations from 10 to 15%. Of significance also is the fact that there are available today aluminum alloys having an endurance limit within the range of 18,000 to 24,000 psi.

Much has been done to improve the technique for solution treating and aging to develop maximum physical properties. For example, to overcome the poor physical properties exhibited in the center of large sections due to slow cooling during quenching, many large sections are being heat treated after rough machining. The aluminum industry has made every effort to provide consumers with adequate information regarding the control of heat treating operations. In spite of this, Mr. Dix finds that users occasionally overheat during solution treating. The result is decreased physical properties resulting from melting of grain boundary constituents.

Users of wrought aluminum alloys must take into consideration the nonuniformity of physical properties with respect to different grain directions resulting from metal flow during cold and hot working. Mr. Dix cited a case of hand-forged blocks in which the elongation in the longitudinal direction was 7 to 9%, Whereas in the short transverse direction the elongation was only 1 to 2%. We are benefiting today from much that has been learned through studies to improve the directional properties of wrought aluminum alloys.

Data were presented showing that when heated above 300 to 400°F., aluminum alloys show rapidly decreasing creep and rupture strength. Mr. Dix described developments in composition improvements and fabrication techniques which have enabled designers during the last decade to take advantage of these significantly increased high-temperature strengths.

Explain Atomic Age Metallography

Present at the Joint Meeting of the Inland Empire and Columbia Basin Chapters in May in Pullman, Wash., Were, From Left, G. L. Flint, Chairman, Columbia Basin Chapter; L. D. Turner, Speaker, General Electric Co.'s Richland Works; L. J. Barker, Kaiser Aluminum & Chemical Corp.; T. C. Nelson, Jr., Speaker, and O. J. Wick, From General Electric Co.'s Hanford Works. The speakers gave a talk on "Atomic Age Metallography"

Reported by F. R. Morral

Head, X-Ray Diffraction Dept.
Kaiser Aluminum & Chemical Corp.

Members of the Inland Empire Chapter met with guests from the Columbia Basin Chapter in Pullman, Wash., on May 23. The business meeting resulted in the election of Servet A. Duran, assistant professor at the State College of Washington, as chairman of the Inland Empire Chapter.

T. C. Nelson, Jr., of General Electric Co.'s Hanford Works, and L. D. Turner, of the applied research unit of General Electric Co.'s Richland plant, talked on "Atomic Age Metallography".

Mr. Nelson spoke on the remote handling of high-alpha emitters. The primary isotope of plutonium, 239, produces about 140,000 alpha particles per minute per microgram, plus secondary beta and gamma radiations. Because of this very high rate of alpha emission, the lifetime total body retention of plutonium has been set at a very minute amount. The human system may take in the alpha-emitting materials through open wounds, which is most serious, or by inhalation or ingestion.

A few centimeters of air will stop alpha particles, as will 0.006 in. of aluminum, thin mica, paper, or lucite. The airborne problem has made necessary the use of gloved boxes for all operations.

Mr Nelson showed the melting, rolling, dry and wet polishing equipment, the microscopic and X-ray diffraction equipment, the dilatometer, hardness testers, and and other mechanical equipment. All of this equipment is enclosed in gloved boxes to permit the working and examination of plutonium and its alloys with no hazards for the operators.

A compact central recording and controlling panel permits high flexibility in the use of continuous measuring devices.

Mr. Turner spoke on the materials, equipment, furniture, and instruments that are used in making metallurgical evaluations of radioactive materials, which are to be made in a new building which he described in detail.

For the beta and gamma-emitting materials, the studies will be made in 4 ft. x 4 ft. x 6 ft. work cells with 10½ and 15-in. thick cast iron walls, costing approximately $72,000.

Great ingenuity had to be used in the design to permit ease of assembly, examination of operations within the cell, bringing in and removal of utilities, ease of decontamination, proper control of temperatures and circulation of air.

The types of tests which are contemplated are the usual metallographic examinations, hardness, density, conductivity, X-ray diffraction, dilatometry, creep, fatigue, impact, corrosion and calorimetry. It is hoped that these investigations will result in materials that will be more economical for use in nuclear reactors. thereby reducing their cost.

Past Chairmen Hear Cold Forming Discussion

Past-Chairmen's Night at Calumet Chapter's May Meeting Honored, Rear, From Left, Past Chairmen E. T. Schwendemann, I. N. Goff, E. W. Taylor, P. H. Parker, H. B. Wishart, R. B. Lucas, F. S. Sutherland, C. E. Chapman, H. H. Feierabend, and J. E. Drapeau. Front, from left, are J. R. Woodfill, secretary; J. R. Bateman, vice-chairman; A. J. Scheid, Jr., chairman; R. H. Heyer, who spoke on "Steel Sheets for Cold Forming and Drawing"; W. W. Hintalla, treasurer; and J. A. Rassenfoss, program chairman

Reported by J. R. Bateman
Standard Forgings Corp.

Calumet Chapter held its annual Past Chairmen's Night on May 13. Election of officers for the coming year was held and the slate, as presented by the Nominating Committee, was elected unanimously. R. H. Heyer of Armco Steel Corp., talked on "Steel Sheets for Cold Forming and Drawing".

The two milestones in the development of present day methods for manufacturing drawing quality sheets, according to Mr. Heyer, are first, the introduction of the normalizing furnace during the middle 1920's and, second, about the same time, the development of the continuous rolling mill.

After a brief description of the rolling process and equipment, Mr. Heyer stated that, in spite of the capital expenditure, sheets which sold for $115 per ton in 1926 could now be purchased for $104 per ton, and that 1952 sheet is far superior in quality and uniformity to 1926 sheet, while the dollar has 32% less purchasing power in 1952.

A fine-grain sheet is necessary for a deep drawing operation so, to avoid coarse grain in box annealed sheets, it is necessary to have a cold reduction of 30% or more, with 40 to 60% preferred. Recrystallization will take place at a temperature of 1100°F., but 1200 to 1350°F. is preferred to obtain better mechanical properties.

The appearance of stretcher strains during a drawing operation is undesirable, because they create a finishing problem. This problem may be eliminated by prestraining the material either by cold rolling or stretching. It requires about 1% reduction by rolling to do the same as a 5% stretch, so rolling is the more efficient and practical method for eliminating the appearance of the stretcher strains. This stretcher strain, or yield point elongation, when present in relatively small amount, may be eliminated by bending. An efficient roller leveler will strain the metal enough to eliminate the occurrence of the strain in drawing operations.

Time plays an important part in strain conditioning as there is a tendency toward its return after a short period of aging. This aging is more prominent in cold reduced annealed sheets than in hot reduced normalized and is one of the principal disadvantages in the use of this material. Sheets made from killed steel do not age, but retain the same properties for years. The killed steel sheets also have the advantage of less carbon and sulphur segregation, but the disadvantage of higher production costs over rimmed steels.

Drawing quality is a frequency concept, and as such, uniformity plays a large part. Uniformity of steel and production methods, by both the steel producer and the user of the sheets, will determine the frequency of breakage of a heat or type of steel.

To date there has been no infallible test established to determine the drawing quality of a steel. Steel mills have, however, established standard methods of processing so control testing is adequate to insure the material having the same degree of proved drawing quality which has previously been established. The most useful of the control tests are microstructure and hardness. This mill processing is changed according to recommendations or information received from mill representatives who have observed the sheets in process at the user's plant. Under this practice, the quality of the sheets is maintained to give an acceptable maximum breakage on a certain application and have a satisfactory surface after the drawing operation.

Mention was made of several developments in testing and their possible success as tests to predict drawability of steels.

Mr. Heyer closed his talk with a slide of the new Home Office of the steel industry—The Capitol.

A short coffee talk was given by Paul T. Meier of Purdue Technical Extension Division on the importance of education to foremen and technical assistants. Mr. Meier asked industry to look ahead and train men of possible foremanship ability to enable them to take more responsible positions when the opportunity arises, thus insuring the availability of foremen in the future.

Foundry Course Scheduled

The Harry W. Dietert Co., Detroit, will hold its 1952 session of the Dietert Foundry Sand School August 11, 12 and 13, from 9:00 a.m. to 4:00 p.m. at the Rackham Memorial Building, 100 Farnsworth, Detroit. The subject of this series of lectures is "The Application of Practical Sand Control to Foundry Operations". Instructor for the course will be Frank S. Brewster, general manager of the company, and the course is open to everyone without cost.

Twenty Years Ago

Quotes From *Metals Review* June 1932

"Shielded Arc" is Cincinnati's topic —J. C. LINCOLN, chairman of the board, Lincoln Electric Co., explains process and results."

"More than 200 members and guests of Golden Gate Chapter met at the University of California on May 16. The main attraction was the operation of the four million pound testing machine recently installed in the new engineeering materials laboratory."

1952 Preprint List

Papers for Presentation at the National Metal Congress, Philadelphia, October 1952, and Western Metal Congress, LosAngeles, March 1953

All of the following papers will be preprinted for distribution to members of the American Society for Metals upon request. The Society will print only 10% in excess of the number of orders for preprints in the office on press date, and this excess 10% will be sent out as long as it lasts. Order the papers by their numbers before August 15, 1952.

1. **Microconstituents in High-Temperature Alloys,** by H. J. Beattie, Jr., Physicist, and F. L. VerSnyder, Metallurgist, General Electric Co., Thomson Laboratory.

2. **Sigma Formation and Its Effect on the Impact Properties of Iron-Nickel Chromium Alloys,** by A. M. Talbot and D. E. Furman, Research Laboratory, International Nickel Co., Inc.

3. **Mechanism of the Carburization of Some Stainless Steels,** by J. B. Giacobbe, Metallurgist, Superior Tube Co.

4. **The Electrolytic Separation and Some Properties of Austenite and Sigma in 18-8-3-1 Chromium-Nickel-Molybdenum-Titanium Steel,** by T. P. Hoar, Department of Metallurgy and K. W. J. Bowen, Research Department University of Cambridge, Cambridge, England.

5. **Creep-Rupture and Recrystallization of Monel from 700-1700° F.,** by N. J. Grant, Associate Professor, and A. G. Bucklin, Department of Metallurgy, Massachusetts Institute of Technology.

6. **Influence of Grain Size on High-Temperature Properties of Monel,** by Paul Shahinian and J. R. Lane, Metallurgical Division, Naval Research Laboratory.

7. **Creep and Rupture of Chromium-Nickel Austenitic Stainless Steels,** by E. J. Dulis, G. V. Smith, and E. G. Houston, Research Laboratory, U. S. Steel Co.

8. **Recrystallization and Grain Growth in Alpha Brass,** by S. L. Channon, E. I. duPont deNemours and Co., and H. L. Walker, Head, Department of Mining and Metallurgical Engineering, University of Illinois.

9. **The Effect of Composition on the Temperature of Spontaneous Transformation of Austenite to Martensite in 18-8 Type Stainless Steel,** by G. H. Eichelman, Metallurgist, American Brass Co., and F. C. Hull, Manager, Metallurgical Section, Westinghouse Electric Corp.

10. **The Effect of Silicon on the Tempering of Martensite,** by A. G. Allten, and P. Payson, Assistant Director of Research, Crucible Steel Co. of America.

11. **The Mechanism and Kinetics of the First Stage of Tempering,** by C. S. Roberts, Metallurgical Laboratories, Dow Chemical Co., B. L. Averbach, Assistant Professor and Morris Cohen, Professor of Physical Metallurgy, Massachusetts Institute of Technology.

12. **The Order-Disorder Transformation Viewed as a Classical Phase Change,** by F. N. Rhines, Professor of Metallurgy, and J. B. Newkirk, Carnegie Institute of Technology.

13. **An End-Quench Test for Determining the Hardenability of Carburized Steels,** by F. X. Kayser, Research Metallurgist, and R. F. Thomson, Head, Metallurgy Department, Research Laboratories Div., General Motors Corp.

14. **The Influence of Boron on Case Hardenability in Alloy Carburizing Steels,** by C. F. Jatczak, Research Metallurgist, and E. S. Rowland, Chief Metallurgical Engineer, Timken Roller Bearing Co.

15. **Effect of Carbon Content on 18-4-1 High Speed Steel,** by A. H. Grobe, Research Metallurgist, and G. A. Roberts, Chief Metallurgist, Vanadium-Alloys Steel Co.

16. **Correlation of Machinability With Inclusion Characteristics in Resulphurized Bessemer Steels,** by L. H. vanVlack, Process Metallurgist, U. S. Steel Co.

17. **Temperature Dependence of the Hardness of Pure Metals,** by J. H. Westbrook, The Knolls, Research Laboratory, General Electric Co.

18. **Hardness of Various Steels at Elevated Temperatures,** by F. Garofalo, P. R. Malenock and G. V. Smith, Research Laboratory, U. S. Steel Co.

19. **Some Properties of a Nodular Iron at Elevated Temperatures,** by M. S. Saunders, Graduate Student, and M. J. Sinnott, Associate Professor of Chemical and Metallurgical Engineering, University of Michigan.

20. **Accelerated Strain Aging of Commercial Sheet Steels,** by L. R. Shoenberger, Research Engineer, and E. J. Paliwoda, Research Engineer, Jones and Laughlin Steel Corp.

21. **The Effect of Quenching and Tempering on Residual Stresses in Manganese Oil-Hardening Toolsteel,** by H. J. Snyder, Research Associate, Mellon Institute of Industrial Research.

22. **X-Ray Measurement of Residual Stress in Hardened High Carbon Steel,** by A. L. Christenson, Research Metallurgist, and E. S. Rowland, Chief Metallurgical Engineer, Timken Roller Bearing Co.

23. **The Endurance Limit of Temper Brittle Steel,** by R. D. Chapman, Research Metallurgist, and W. E. Jominy, Chief Metallurgist, Research, Chrysler Corp.

24. **Plastic Stress-Strain Relations of Alcoa 14S-T6 for Variable Biaxial Stress Ratios,** by Joseph Marin, Professor of Engineering Mechanics, L. W. Hu and J. F. Hamburg, Department of Engineering Mechanics, Pennsylvania State College.

25. **The Effect of Various Heat Treating Cycles Upon Temper Brittleness,** by J. D. Jaffe and D. C. Buffum, Watertown Arsenal Laboratory, and F. L. Carr, National Research Corp.

26. **Effect of Hardness on the Level of the Impact Energy Curve for Temper Brittle and Unembrittled Steel,** by F. L. Carr, National Research Corp., M. Goldman, L. D. Jaffe and D. C. Buffum, Watertown Arsenal Laboratory.

27. **Transverse Mechanical Properties in an SAE 1045 Forging Steel,** by A. H. Grobe, Research Metallurgist, Vanadium Alloys Steel Co., Cyril Wells, and R. F. Mehl, Director, Metals Research Laboratory, Carnegie Institute of Technology.

28. **The Determination of the Plastic Constants of Metals by the Ultrasonic Pulse Technique,** by M. B. Reynolds, Knolls Atomic Power Laboratory, General Electric Co.

29. **Mechanical Properties and Strain Aging Effects in Titanium,** by F. D. Rosi and F. C. Perkins, Metallurgical Laboratories, Sylvania Electric Products, Inc.

30. **The Influence of Insoluble Phases on the Machinability of Titanium,** by R. M. Goldhoff, H. L. Shaw, C. M. Craighead and R. I. Jaffe, Battelle Memorial Institute.

31. **Mechanical Properties, Including Fatigue of Titanium-Base Alloys RC-130-B and Ti-150-A at Very Low Temperatures,** by S. M. Bishop, Research Fellow, J. W. Spretnak, Associate Professor and M. C. Fontana, Professor and Chairman, Department of Metallurgy, Ohio State University.

32. **The Titanium-Oxygen System,** by E. S. Bumps, Metallurgist, Studebaker Corp., H. D. Kessler, Supervisor, Nonferrous Metals Research, and M. Hansen, Chairman, Metals Research, Armour Research Foundation.

33. **A Study of the Mechanism of the Delayed Yield Phenomenon,** by T. Vreeland, Jr., D. S. Wood and D. S. Clark, Department of Mechanical Engineering, California Institute of Technology.

34. **The System Zirconium-Tin,** by D. J. McPherson, Supervisor, Physical Metallurgy Research, and M. Hansen, Chairman, Metals Research, Armour Research Foundation.

35. **The Martensite Transformation Temperature in Titanium Binary Alloys,** by Pol Duwez, Professor of Mechanical Engineering, California Institute of Technology.

36. **Properties of Some Hydrogen-Sintered, Binary Molybdenum Alloys,** by W. L. Bruckart, M. H. LaChance, C. M. Craighead and R. I. Jaffee, Battelle Memorial Institute.

37. **The Effect of Dispersions on the Tensile Properties of Aluminum-Copper Alloys,** by R. B. Shaw, L. A. Shepard and C. D. Starr, Research Engineers, and J. E. Dorn, Professor of Metallurgy, University of California.

38. **Some Properties of High-Purity Zirconium and Dilute Alloys With Oxygen,** by R. M. Treco, Research Metallurgist, Bridgeport Brass Co.

39. **Determination of Oxygen in Metals and Metal Oxides by the Isotopic Method,** by A. D. Kirshenbaum and A. V. Grosse, Research Institute of Temple University.

40. **The Indium-Arsenic System,** by T. S. Liu, Horizons, Inc., and E. A. Peretti, Acting Head, Department of Metallurgy, University of Notre Dame.

41. **The System Zirconium-Silicon,** by C. E. Lundin, Associate Metallurgist, D. J. McPherson, Supervisor, Physical Metallurgy Research, and M. Hansen, Chairman, Metals Research, Armour Research Foundation.

Rolling and Forging Panel Discussion Held

Present at the Panel Discussion on "Rolling and Forging of Alloy Steel" at the March Meeting of the Canton-Massillon Chapter Were, From Left, J. F. Lee, Supervisor, Metallurgical and Chemical Laboratories, Ford Motor Co., Canton, Ohio; R. W. Crawford, Superintendent of Rolling Mills, Steel and Tube Division, Timken Roller Bearing Co.; L. M. Immel, Superintendent of Blooming Mill, Canton Steel Works, Republic Steel Corp.; E. R. Johnson (Moderator) Assistant District Manager, Central Alloy District, Republic Steel Corp.; L. H. Bowers, Superintendent, Forging Division, Canton Drop Forging and Manufacturing Co.; and J. Ricker, General Sales Manager, Industrial Steel and Forge, Inc. (Photograph by E. Miller)

Reported by Wells E. Ellis

Research Metallurgist
Timken Roller Bearing Co.

The March panel-type meeting of the Canton-Massillon Chapter A.S.M. continued a popular innovation adopted during the 1950-51 season. The moderator, E. R. Johnson, was well-prepared with questions, which were submitted in writing prior to the meeting.

Most interest centered on questions concerned with the rolling and forging of boron steels, surface quality, forging presses versus forging hammers, and the problem of decarburization. The experts all agreed that the boron steels forge and roll just as well as the conventional alloy grades.

The Timken 16-25-6 alloy and the martensitic grades (Type 400 series) of stainless steels were considered more difficult to handle in forging and rolling. Close cooperation between the die designer and the forging department was advocated for the production of quality forgings. Also, the recent trend toward automatic temperature control in billet reheating furnaces was considered to be an important improvement contributing to better quality in rolling and forging.

Howard Foundry Expands

The Howard Foundry Co., Chicago, has purchased the investment casting division of Allis-Chalmers Manufacturing Co. The plant will continue to operate in the Allis-Chalmers plant in Milwaukee.

The change was made with no halt in production. All key personnel formerly associated with this division of Allis-Chalmers are now working for Howard Foundry Co. It is the company's intention to expand this operation just as soon as permanent headquarters can be obtained.

Ottawa Valley Forms Educational Committee

The Ottawa Valley Chapter has formed a committee which will act in cooperation with vocational guidance committees of the secondary schools in Ottawa. It hopes to have speakers address the students on the advantages of entering the field of metallurgy as a profession.

The Chapter donated two $25 prizes to Carleton College and Ottawa University to be given to an engineering student with high standing at the end of his first year.

Talks on Alloys for High-Temperature Use

Enjoying Themselves at a Recent Meeting of the Chicago Chapter Are, From Left: E. L. Roff, Vice-Chairman; C. T. Prendergast, Chairman; V. T. Malcolm, Who Spoke on "Selection of Steel Alloys for High-Temperature Service"; and E. J. Pavesic, Technical Chairman of the Meeting

Reported by M. J. Vandenberg

Sales Engineer
Park Chemical Co.

"The Selection of Steel Alloys for High-Temperature Service" was discussed by V. T. Malcolm, director of research for the Chapman Valve Manufacturing Co., during the February meeting of the Chicago Chapter, which was also Sustaining Members' Night.

The choice of alloy steels and operating conditions are factors affecting basic design.

Selection of steels for high-pressure service at temperatures around 900° F. or above is a complex problem, and usually results in a compromise of a number of important fabricating and design factors, such as:

1. Strength and ductility at operating temperatures.
2. Resistance to oxidation and scaling.
3. Retention of satisfactory mechanical and corrosion resistant properties after extended exposure under operating conditions.
4. Resistance to the corrosive attack from media in contact with the metal.
5. Resistance to warping or cracking because of thermal stresses in applications involving intermittent heating and cooling.
6. Weldability.
7. Structural stability.
8. Abrasion and wear resistance.
9. Ease of fabrication.
10. Cost.

The successful use of steel under high temperature necessitates the use of special tests such as long-time creep, stress-rupture, relaxation and scaling resistance. Mr. Malcolm explained the conditions limiting interpretation of results of each of these tests. For example, many mathematical equations connect the stresses with the creep rates prevailing at a constant temperature but ignore the transient creep rates. Yet in many systems these transient creep rates predominate, he warned. However, the general qualitative aspects of mathematical treatment are interesting, and appear to have some theoretical and experimental justification.

We have been hearing quite a bit about "thermal shock" lately, and Mr. Malcolm pointed out that there is considerable difference between thermal stresses and thermal shock, because here we are confronted with a transient effect.

Ferritic steels seem to have a considerable advantage over austenitic steels under thermal shock. The latter have high expansion characteristics, and when exposed to wide swings of temperature, the high stresses produced result in failure.

Many studies have been made on grain size as a critical factor affecting high-temperature properties. It appears that if the ferrite grain size is six or coarser, good properties are obtained. Nonuniform grain size affects the properties of steels more than a fine grain.

Surface stability of a steel must not deteriorate excessively through scaling or oxidation. Mr. Malcolm also related these factors to corrosion, and explained the effect of various alloying elements.

Stability of steels at the temperature of operation is extremely important because any alloy used must not deteriorate by any mechanism, either exterior or interior. High strength is of no value if long periods at temperature develop instability.

Discusses Growth of Industries in Spain

Reported by F. M. Krill

Head, Metallographic Laboratory
Kaiser Aluminum & Chemical Corp.

The Inland Empire Chapter A.S.M. held a joint meeting with the Inland Empire Chemists on April 16. The speaker, F. R. Morral, of the division of metallurgical research, Kaiser Aluminum & Chemical Corp., gave a talk on metallurgical and chemical industries in Spain.

Mr. Morral introduced his talk with a personal movie he had made while on a trip in 1950, and the film "Flight to Spain", made by Trans World Airlines. He highlighted some of the characteristics of the country and the people, illustrating with historical developments. He pointed out the advances in metallurgical and chemical industrialization, and discussed developments in engineering by describing briefly the Talgo train and the Pegaso automobile.

Mr. Morral pointed out that there has been some participation of foreign capital, together with that of the Spanish Institute of Industries, to extend industry, and, in particular, the petroleum refining industries. The foreign capital participation, particularly from the United States, has been practically negligible, but with the new Spanish minister, Planell, it may become more important.

The speaker closed his talk by citing the contributions that Spain can make to help bulwark the free nations of Europe.

New Officers Elected By Hartford Chapter

Reported by Edward R. Belden

Metallurgist, Pratt & Whitney Div.
Niles-Bement-Pond Co.

Past Chairmen's Night was held by the Hartford Chapter on May 9. Sixteen past chairmen attended, including national past presidents, Frank P. Gilligan and A. H. d'Arcambal.

E. L. Wood, director of research, Springfield Armory, also a past chairman, spoke on "Castings for Small Arms". He discussed and compared the applications of castings such as pearlitic malleable iron, ductile cast iron, and steel made by the investment method, and of parts made by powder metallurgy. He illustrated his talk with slides.

Prior to Mr. Wood's talk, the annual business meeting was held. Results of elections for next year's officers were as follows: H. F. Sprague, New Departure Division, General Motors Corp., chairman; W. Mounce, International Nickel Co., vice-chairman; W. E. Borin, Underwood Corp., secretary-treasurer. E. L. Bartholomew, Jr., of University of Connecticut, E. B. Bartek, Bethlehem Steel Co., and H. M. Brodsky, Fafnir Bearing Co., were elected to the executive committee for a three-year term.

Chairman Paul Fletcher awarded a past-chairman's certificate to John Mertz, and 25-year silver certificates to W. D. Fuller, W. D. MacDermid, and E. R. Belden.

New Plant Announced

Metal Carbides Corp., Youngstown, Ohio, has announced plans to construct a $1,000,000 plant on a 17-acre site in Boardman, Ohio, a suburb of Youngstown. The new plant will have a monthly capacity of approximately 25,000 lb. of tungsten carbide metal, tungsten alloy heavy metal, titanium and other special alloys made from powdered metals.

Lectures Reveal Boron As Effective Substitute For Critical Alloys

Reported by G. E. Hersam

Industrial Power Engineer
Pacific Gas & Electric Co.

After nine months of extensive experience, convincing proof that boron is a successful substitute for critically short alloys has been found, according to Porter W. Wray, manager of stainless steel bureau, and alloy steel bureau of United States Steel Co., who lectured at a recent series of educational lectures sponsored by the Golden Gate Chapter. The subject of the series was "The Conservation of Critical Alloys in the Constructional Alloy Steels".

For the majority of applications for the constructional alloy steels, boron can probably replace a sizable quantity of nickel, chromium, molybdenum, and other critical alloys where their presence is necessary only for adequate hardenability, Mr. Wray stated.

It is evident that boron can replace several hundred times its own weight of hardening alloys.

The alloy shortage is worse today than it was during World War II. The United States was forced to make extravagant use of its highest grade ore during that emergency, and now is mining lower grade deposits. In the meantime, steel production has risen 30%. In addition, military equipment today requires richer alloys. If the war in Korea should spread, demands for alloy steel for military equipment may leave very little for other use. The potentialities of boron are the one ray of hope which brightens a dim picture, Mr. Wray concluded.

Ottawa Valley Hears Discussion on Nuclear Physics and Metals

Reported by A. S. Vince

Royal Canadian Mint

At the Ottawa Valley Chapter meeting on April 8, L. G. Cook, head of the chemical research section of Atomic Energy of Canada Ltd., discussed the metallurgical problems connected with the production of atomic energy.

As he has worked since 1936 in fields closely related to the atomic structure of metals and the atomic energy project, Dr. Cook is well-qualified to describe the tremendous advances made in these particular fields in the past decade. These advances, which have led to the construction of atomic piles, have introduced many new concepts to the metallurgist. For example, on the consideration of capture cross section alone, tremendous impetus was given to the technology of the rare metals, such as zirconium, now required for structural purposes.

It was found that under conditions of intense radiation, transmutation of elements occurred in appreciable quantities, giving alloys in place of the original pure metal. Thus, aluminum, in the expected life of a pile, would become an aluminum-silicon alloy.

The rate at which various elements reach their maximum activity after exposure in the pile and the subsequent decay of this activity, are important in choosing such parts as sample holders which must be handled after exposure.

The effect of neutron bombardment on cold working, recrystallization, order-disorder transformation, and diffusion, was also discussed. These phenomena under neutron bombardment demand metals of extremely high purity for pile construction, since many of the common impurities, even in trace amounts, completely alter the properties of the material under conditions of radiation.

Ordinary chemical and spectrographic analyses are not sufficiently accurate to determine trace elements. Dr. Cook described the special methods of combined exposure to radiation, chemical extraction and radiation counting. By such methods, accurate analysis of some elements in the range of 10-13% has been established.

Metallurgical Progress Reviewed at Purdue

At the Speaker's Table at the February Meeting of the Purdue Chapter Are, From Left, C. R. Anderson, Aluminum Co. of America, Vice-Chairman; A. L. Hurst, Aluminum Co. of America, Chairman; R. F. Miller, Assistant to the Vice-President of Research and Technology, United States Steel Corp., Who Discussed "A Half Century of Metallurgical Progress"; and G. M. Enos, Professor of Metallurgy, Purdue University, Technical Chairman. (Photograph by W. F. Bertram, Haynes Stellite Co.)

Reported by Jan M. Hoegfeldt

Haynes Stellite Co.

R. F. Miller, assistant to the vice-president of research and technology of United States Steel Co., outlined "A Half Century of Metallurgical Progress" before the February 19 meeting of the Purdue Chapter.

After discussing some of the major differences in metallurgy in the United States 50 years ago and at the present time, Dr. Miller presented three outlines of progress for the last half century and commented on their meaning.

The first of the three charts shown summarized the work of the metallographers and was highlighted by such developments as the equilibrium diagrams (1904), isothermal transformations (1930), martensite transformation, (1941), and the American Society for Steel Treating (1917, the beginning of the A.S.M.).

The second chart illustrated the work of the physical metallurgists with such outstanding events as, for example, the presentations of the true stress-strain curve (1909), X-ray crystallography (1912), creep (1920), and lattice imperfection theory (1935).

The progress of the chemical metallurgists as presented in the third outline includes many developments such as the chrome-vanadium steels (1906), the induction furnace (1917), the gradual evolution of more efficient methods of extraction and purification, and the standardization of fewer but more efficient steels and alloys.

Dr. Miller commented on the relatively few new principles that have actually found use in the production of steel during the past half century. The speaker mentioned some of the foreseeable future developments, with particular attention to the technology at United States Steel's Fairless works at Trenton, N. J.

Dr. G. M. Enos, professor of metallurgy, Purdue University, served as technical chairman for the meeting.

A color-sound film, "Building for the Nations", depicting the basic steel frame construction of the United Nations Building in New York, was shown through the courtesy of the United States Steel Corp., as the "coffee" subject.

Talks on Deep Drawing Steels at Fort Wayne

Reported by A. D. Carvin
Joslyn Mfg. & Supply Co.

Samuel Epstein, research engineer, Bethlehem Steel Co., spoke on "Deep Drawing Steels" before the Fort Wayne Chapter at a dinner meeting on April 14.

Sheet steel is the most important tonnage steel today, according to Mr. Epstein. One of the greatest inventions in the industry is the continuous mill for rolling sheet, which allows the large tonnage we get today of much better quality steel, and a great deal of study is still being conducted toward further improvements.

Hot rolling is done with a minimum temperature of 1600° F. During the rolling of sheet, its length becomes 500 times greater than the length of the original ingot.

Low-carbon rimmed steel for drawing produces good surface, and has excellent drawing properties, but is subject to aging. Aluminum killed steel (4 or 5 lb. per ton of steel) is nonaging, but the surface is not as good as that of rimmed steel. A nonaging rimmed steel is produced by the addition of about 0.05% of vanadium, which does not deoxidize the steel, but combines with the nitrogen to make the steel nonaging. Vanadium-treated steel tends to have a finer grain. The rate of cooling of the hot-rolled strip also influences grain size. Ordinary rimmed steel is allowed to cool fast before being coiled, but vanadium-treated steel is coiled hot to slow up its cooling, in order to obtain desired grain size. The usual manganese content in sheet steel is helpful in giving a uniform grain size upon annealing.

Whether a steel is age hardening or not can be determined by pulling a tensile test specimen while it is heated to 400° F. An age hardening steel has a higher tensile strength at 400° F. than at room temperature; a nonaging steel has a lower tensile strength at 400° F. than at room temperature. At the elevated temperature, an age hardening steel age hardens instantly while it is being stretched during the tensile test.

The carbon, manganese, sulphur and phosphorus content should be kept low to keep hardness low. The precentage of these elements is easy to control during manufacture of the steel. Copper, nickel, tin, and molybdenum should be kept low as they have a hardening effect. The sum of the percentages of copper, nickel, and molybdenum should be not more than 0.15%. The hardness for deep drawing steel should be kept under Rockwell B-50. It appears that in automobile body sheets steel 0.05 to 0.10% of copper aids corrosion resistance and gives better paint adherence.

The mechanical properties of deep drawing steel are practically the same in the transverse direction as in the longitudinal direction, which is desirable in drawing operations.

McFarland Speaker Stresses Conservation

W. W. Sieg (Left), President of Titan Metal Manufacturing Co., Accepts the McFarland Award for Achievement in Metallurgy From R. W. Lindsay, Chairman of the Award Committee of Penn State Chapter at the April Meeting

Reported by R. W. Lindsey

Associate Professor of Metallurgy
Pennsylvania State College

The fourth annual McFarland Award Banquet of the Penn State Chapter was held on April 25 in State College. The award was presented this year to W. W. Sieg, president of the Titan Manufacturing Co. R. W. Lindsay, chairman of the award committee, made the presentation in place of D. F. McFarland who was unable to attend.

In an address entitled "Securing Our Competitive Position", Mr. Sieg pointed out that conservation of the nation's metals and other natural resources is now more necessary than ever before. We are spending millions of dollars to develop ore deposits outside the United States at the same time millions and millions of tons of scrap are being wasted. This wasted scrap is better than ore in the ground since it has gone through all the processes of refinement and, in many instances, represents the finest quality that metallurgy has produced.

Mr. Sieg reviewed metallurgical and other developments which have enabled his company to increase its production tremendously since 1930 in achieving a position as one of the nation's largest producers of brass and bronze rod products, brass forgings, and brass pressure die castings.

In closing, Mr. Sieg stated that governmental controls should be limited to defense items, so that we may not stray too far from the objectives of the founders of this nation.

Los Alamos Hears Talk on Chromium Plate

Reported by D. D. Whyte
University of California

At the May meeting of the Los Alamos Chapter, Roger Moeller, a former staff member of the Los Alamos Scientific Laboratory, and now with Spar-Tan Engineering Co., presented a talk on "Some Forms and Uses of Chromium and Pure Iron". He mentioned several uses for porous chromium plate which depend on the ability of its surface to contain lubricants.

An entertaining coffee talk was presented by Robert Cox, local high school athletic director, and new chapter officers were installed.

Chase Training Program

The Chase Brass & Copper Co., has announced an employee training program to assist employees in development of greater abilities, skill and know-how. An engineering course has been started by a small group of men to review basic arithmetic, algebra, geometry and trigonometry. After completing the reviews, the men will study college physics. A course in metallurgy, under the direction of James Chafey of the Chase research laboratory, is also in prograss. Mr. Chafey is a member of the New Haven Chapter.

Trends in Material Testing Outlined

Reported by A. E. Leach

Metallurgical Engineer
Bell Aircraft Co.

A major industrial trend in manufacturing is toward closer quality control. Statistical sampling is becoming a commonplace tool for maintaining the high standards demanded by modern fabricators.

Thus, W. C. Wheadon, administrative director of the Institute of Industrial Research, Syracuse University, outlined the "Present Trends in Material Testing" before the Buffalo Chapter on April 10. In addition, Mr. Wheadon called attention to the increasing practice of specifying steels by hardenability, with less attention to chemical composition.

Environmental testing is another field which is attracting more of the test engineer's attention. This is the technique of subjecting components to tests which simulate actual service conditions. A typical example is the dust-abrasion test.

Nondestructive tests are finding new fields of application constantly, but too seldom is it realized that nondestructive tests must be backed up by destructive tests to determine that indicated flaws are actually harmful to the serviceability of a part. If such a correlation cannot be found to exist, then the nondestructive test serves no useful purpose; it may even cause an unnecessarily high rejection rate.

Mr. Wheadon noted an unfortunate tendency to specify nondestructive test standards on the basis of fear rather than actual knowledge of the effect of the indicated flaw. This is less prevalent today than in the recent past, but it was emphasized that destructive tests will remain a very necessary crutch to nondestructive techniques.

High-temperature dynamic creep testing is the newest and most important addition to testing techniques. It was developed when premature service failures occurred in jet engine turbine blades whose life expectancy was based on conventional, static, creep and stress-rupture data. Reasoning that such failures resulted from vibratory stresses, engineers built machines which superimposed a cyclic stress upon a static tensile stress. With these machines, creep was measured at various temperature levels. Results indicate that at temperatures below 1500° F., elongation is reduced and failures are brittle, being almost identical to fatigue failures. At temperatures above 1500° F., the vibratory stress may cause an increased rate of precipitation of age hardening constituents, thereby actually improving resistance to creep as indicated by static creep tests at those temperatures.

Speaks on Materials in Electric Industry

In Consultation With Truman S. Fuller (Center), Principal Speaker at the Joint Meeting of the Columbia Basin Chapters of A. S. M. and the American Institute of Chemical Engineers Are C. E. Kent, Chairman of the A. I. CH. E. Chapter, and G. L. Flint, Chapter Chairman, A. S. M.

Reported by J. V. McMaster

Metallurgist, General Electric Co.

In a talk supplemented by colored slides, Truman S. Fuller, engineer in charge of the General Electric Works Laboratory, and president of the American Society for Testing Materials, discussed "Improvement of Engineering Materials in the Electrical Industry Over the Past 50 Years" in a talk given before a joint meeting of the Columbia Basin Chapters of A.S.M. and the American Institute of Chemical Engineers in March. Mr. Fuller described some of the applications of engineering materials, related problems, and how these problems are solved.

Mr. Fuller described how hydrogen embrittlement in tough-pitch copper was overcome by the addition of small amounts of silver or cadmium to the copper, and how the discovery of the cause of cracking in segments of railway commutators resulted in the establishment of rupture testing in 1935.

He pointed out how General Electric and Westinghouse research has aided in the improvement of sheet steel used for magnets. It was discovered at the turn of the century that additions of silicon to iron improved its magnetization properties. In 1905, 3% silicon was used, but this amount was increased to 5%, which was considered optimum until 1933. In 1934, additions of 6¼% were considered to produce superior magnet steel and, in 1939, the silicon addition was reduced to 3%, combined with the use of an oriented grain structure in the metal.

Additional advancements in engineering improvements in the electrical field were discussed by Mr. Fuller, including how the size of refrigerator motors has been reduced by 50% since 1930, chiefly as a result of improvements in conductor insulation and how creep and rupture testing are used to select the materials for high-temperature operation in power generation equipment.

The use of normalizing treatment to reduce the graphitization or graphite precipitation in steam turbine parts was also explained. Ultrasonic inspection of wrought parts prior to or during the early stages of machining is used in the same manner as X-ray inspection to inspect the interior of castings. Mr. Fuller explained that this inspection tool has been especially valuable in assuring sound retaining rings for turbine generators, an application where these rings are subjected to a centrifugal force as high as 1¾ million pounds.

Following Mr. Fuller's talk, a Walt Disney technicolor movie developed by General Electric, entitled "Jet Propulsion", was shown.

Metalworking Award to Lynch of Georgia Chapter

Robert S. Lynch, president of the Atlantic Steel Co., has been awarded the Georgia Chapter A.S.M. annual Metalworking Southeast award in recognition of his contributions to the chapter's organization as committee chairman, chapter chairman, national committeeman, and constant benefactor, and in acknowledgement of the inspiration and singular leadership which he has given "Metalworking Southeast."

Mr. Lynch has served as finance chairman of the Georgia Chapter and was chairman during 1946-47. From 1948 through 1951 he served on the advisory committee. He has been a member of the national A.S.M. nominating committee, and has held a 2-year term on the national finance committee. Mr. Lynch was elected a director of the American Iron and Steel Institute at the annual Institute meeting held in New York in May.

Reviews Precipitation Hardening Stainless Steels at Dayton

Reported by Leland F. House

Research Laboratories
Armco Steel Corp.

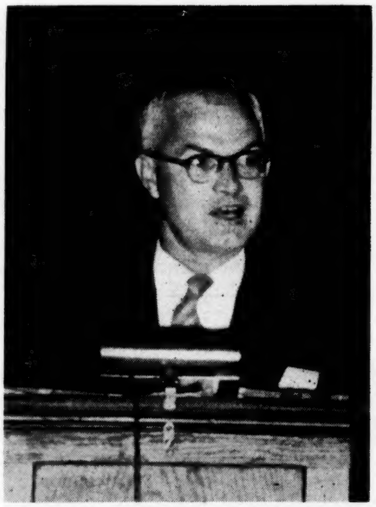
The research laboratories of the steel industry developed precipitation hardening stainless steels to provide characteristics not previously available in the standard stainless steel grades. The members of the Dayton Chapter heard Mr. M. E. Carruthers, supervising metallurgist at the research laboratories of Armco Steel Corp. outline the development, mechanical properties, and applications of "Precipitation Hardening Stainless Steels," at the May meeting.

To acquaint the audinece with the research and development work which have made several of Armco's stainless steel alloys available, the speaker outlined the various grades and types of precipitation hardening stainless steel alloys. Grades which have been proven successful on a commercial scale can be classified as alloys which are marginal with respect to whether their microstructures are austenitic or martensitic. Precipitation hardening occurs in these alloys when they are heat treated in the range of 800 to 1150° F. United States Steel Co. Stainless W, Armco 17-4 PH, and Armco 17-7 PH, are precipitation hardening alloys of this type. These steels depend upon titanium, copper and aluminum additions, respectively, to cause precipitation hardening.

Armco 17-7 PH is an aluminum-bearing precipitation hardening stainless steel. It has sufficient stability to retain a substantially austenitic structure during air cooling from solution annealing, a feature which makes it possible for this steel to be deep drawn or formed much in the same manner as annealed 18-8 stainless steel.

After the forming operations, a heat treatment of 90 min. at 1400° F., followed by air cooling to room temperature, will cause this alloy to have a martensitic structure. To complete this transformation it is necessary to water cool to 60° F. after air cooling from 1400° F. An aging treatment of 30 min. at 950° F., after the 1400° F., heat treatment, will cause a further increase in hardness—an effect due to precipitation hardening. This double heat treatment will develop strengths which, at ordinary temperatures, equal those of the carbon and low-alloy steels. Tensile strength in excess of 200,000 psi. is not unusual.

Stainless W, Armco 17-4 PH and 17-7 PH, have an expansion of 0.004 to 0.005 in. per in. when they undergo their transformation from austenite to martensite. This expansion occurs in Stainless W and Armco 17-4 PH when they are air cooled after solution annealing by the producer.



M. E. Carruthers

Stainless W and Armco 17-4 PH are supplied by producers in the martensite state. A single aging heat treatment at 850 to 1150° F., given by the fabricator, will fully harden these alloys, and will cause only a negligible change in dimension. Armco 17-7 PH is supplied by producers in the austenitic condition. It is necessary for the fabricator to air cool this alloy from 1400° F. to cause the austenite-to-martensite transformation. After this heat treatment the material is aged at 950 to 1050° F. to cause precipitation hardening. With Armco 17-7 PH allowances must be made by the fabricator for the dimensional change when holes are to be drilled or close tolerances are to be held.

Armco 17-7 PH has found many places for application in the aircraft industry. Its high strength in compression and tension, and its weight-to-strength ratio have made it very suitable for structural members of jet aircraft airframe assemblies. Stainless W and Armco 17-4 PH are used extensively in parts machined from bars and rounds. Armco 17-7 PH in the hard temper condition has been used to make various types of springs and carpenter's hand saws. In the hard temper condition this alloy is hardened by a single aging heat treatment at 900° F. The 1400° F. heat treatment normally used in hardening this grade is replaced by heavy cold reduction during the rolling operations to final gage.

Mechanical properties of various steels were illustrated by comparing effect of heat treatments on each of the precipitation hardening alloys.

Oregon Student Paper Award Made

Sam Graf, Chairman of the Oregon Chapter, Is Shown Congratulating the Winner of the Student Paper Contest, R. S. Kemper, Whose Paper "Selection of Materials for an Atomic Reactor" Was Voted Best of the Three Papers Read. Charles Robidart and Etric Stone, students at Oregon State College and O. G. Paasche, chairman of the student affairs committee looks on

Reported by A. H. Roberson

Metallurgist, Bureau of Mines

An inspection tour of the facilities of the Bureau of Mines, Northwest Electrodevelopment Laboratory at Albany, Ore., provided an interesting diversion from the usual evening meetings of the Oregon Chapter on May 23.

About 60 members observed the activities of the electrolytic tin refinery, electric smelting of low-grade ores, zirconium production plant, and the physical metallurgy laboratories.

The dinner meeting which followed the tour was highlighted by the presentation of a 25-year certificate to John P. Walsted, Bureau of Mines metallurgist, and his off-the-cuff "Old Timers" reply.

The student activities committee, headed by Prof. O. G. Paasche, Oregon State College, introduced the authors of the three top student papers. After each man had read and discussed his paper, the audience, by popular vote, declared Robert S. Kemper the winner. Mr. Kemper, a graduate student at Oregon, discussed the "Selection of Materials for an Atomic Reactor".

Chapman Explains Tempering of Substitute Steels

Reported by George F. Sommer

Metallurgist, Link-Belt Co.

R. D. Chapman of the metallurgical research department of the Chrysler Corp. presented recent data on "Tempering Substitute Steels" to the Indianapolis Chapter on Past Chairmen's Night, May 19. W. H. Tunis, manager of the new Indianapolis Chrysler Plant, introduced the speaker as a very accomplished magician—recognized both in this country and in England—and the speaker upheld his reputation very proficiently by interjecting bits of sleight-of-hand into his technical lecture, keeping his audience well entertained.

In presenting background for his lecture, Mr. Chapman reviewed the work of M. A. Grossman who, in 1942, published his work on calculating the ideal diameter of a steel from its chemistry, and how A. L. Boegehold, in work for the Society of Automotive Engineers, had correlated the hardening of various size rounds and end quench bars.

All this work dealt with as-quenched hardness, and only an extremely limited amount of data is available for predicting tempered hardnesses. Crafts and Lamont published some work, as did Holloman and Jaffee, the latter making it possible to calculate tempering time and temperature for a given hardness based on 100% martensite.

Mr. Chapman's work dealt with seven heats of SAE 4000 series "Amola" steels, for which he showed chemical analyses. Samples were normalized, hardened and tempered for varying times with thermocouples welded to the samples, and the actual time at temperature. It was found that most of the tempering action occurred in 15 min. at temperature. However, for the purpose of the investigation, a tempering time of 1 hr. was used, as it was believed that this would most nearly correlate with actual shop practice. Vickers hardness numbers were plotted against distance on the Jominy bar for various tempering temperatures of SAE 4063 steel. In doing this work, the speaker noted that a given structure apparently softens near the temperature at which it was formed. The data also showed that even with tempering temperatures as high as 1275° F., the martensite still was harder than the various tempered intermediate structures which formed on hardening.

Other data presented on slides showed good agreement of predicted hardness with actual hardnesses for a 2-in. round of SAE 4047, and a 1-in. round of SAE 4042 steel. Mr. Chapman also pointed out that at 400° tempering temperature, 0.25, 0.40, and 0.60 carbon steels of the same analysis showed about the same hardness, but at higher tempering temperatures the higher carbon content resists tempering.

An electron micrograph was included in the talk to show bainite and pearlite which were not resolved by a light microscope.

An excellent point brought out by Mr. Chapman was that differences in tempered hardnesses could be expected between heats falling near the extremes of the hardenability band. An instance was shown where a five-point Rockwell spread called for on a drawing could readily be exceeded due to variations of heats within the band.

Data presented by the speaker on tempering of SAE 81B40 and 80B40 boron steels seemed to disagree with some results published. It has been claimed that boron steel should be tempered about 100° F. lower than the steel for which it was substituted. The data reported by Mr. Chapman indicated that the same temperature could be used very successfully for both analyses.

Mr. Chapman closed his interesting presentation with a summary of how one would use his data, and after the close of the meeting he answered numerous questions from the audience.

A. S. M. Review of Current Metal Literature

An Annotated Survey of Engineering, Scientific and Industrial Journals and Books Here and Abroad, Received During the Past Month

Prepared in the Library of Battelle Memorial Institute, Columbus, Ohio

W. W. Howell, Technical Abstracter

Assisted by Joseph Enke, Maxine Runkle and Members of the Translation Group

A GENERAL METALLURGICAL

198-A. The Past, Present, and Future of the Canadian Steel Industry. J. Convey and S. L. Gertsman. *Canadian Mining and Metallurgical Bulletin,* v. 45, May 1952, p. 271-274; *Transactions of the Canadian Institute of Mining and Metallurgy,* v. 55, 1952, p. 181-184.
(A4, ST)

199-A. Malleable Castings in Western Germany. H. Moehl. *Foundry Trade Journal,* v. 92, May 1, 1952, p. 471-472. (Translated and condensed from *Giesserei.)*
Statistics covering production, personnel, etc. (A4, E11, CI)

200-A. Atmospheric Pollution. Louis C. McCabe. *Industrial and Engineering Chemistry,* v. 44, May 1952, p. 121A-122A.
Tests indicate that electrostatic precipitators, when operated wet, are highly efficient for the recovery of fumes and gases from Al alloy processing. (A7, Al)

201-A. The Economics of the Secondary Heavy Metals. E. H. Jones. *Journal of the Birmingham Metallurgical Society,* v. 32, Mar. 1952, p. 4-14.
See abstract of 'Secondary Heavy Metals", *Metal Industry;* item 34-A, 1952. (A8, B10)

202-A. The Industry in the World Today. *Light Metals,* v. 15, May 1952, p. 157-159.
Emphasizes impact of government controls on U. S. aluminum industry. Tabular data. (A4, Al)

203-A. Pressure on Producers Increases "Productivity" of Metal. *Metal Age,* May 1952, p. 4-8. (Based on paper by C. T. Saunders.)
The growth of manufacturing industry and the change in its structure was gaged by measuring the consumption of 16 major raw materials in the United Kingdom from 1851-1950. The summary is limited to seven metals: finished steel, iron products, Cu, Zn, Pb, Al, and Sn. Tables. (A4)

204-A. Outlook For Tin. Clyde Williams. *Monthly Business Review* (Federal Reserve Bank of Cleveland), v. 34, May 1952, p. 8.
New research developments in utilization and in conservation of tin, the supply situation, and future prospects. (A4, Sn)

205-A. A Critical Review of the Literature of 1951 on Sewage, Waste Treatment, and Water Pollution. W. Rudolfs. *Sewage and Industrial Wastes,* v. 24, May 1952, p. 541-641.
Review by the FSIWA Committee on Research. Analytical methods, sewage, industrial wastes, radioactivity, and water pollution. Specific topics of metallurgical interest include determination of cyanides and metallic ions; pickling and acid, and plating and cyanide wastes. 800 ref. (A8)

206-A. Iscor's Importance in the Union's Economy. *South African Mining and Engineering Journal,* v. 63, Mar. 15, 1952, p. 73, 75, 77; Mar. 22, 1952, p. 117, 119, 133.
A survey in reference to the state-sponsored organization, South African Iron and Steel Industrial Corp., Ltd. (A4, Fe, ST)

207-A. Profits From Metal Wastes. C. F. Paulson. *Water & Sewage Works,* v. 99, May 1952, p. 199-201.
New ion-exchange process using Permutit resins recovers chromic acid and demonstrates other operating advantages. (A8)

208-A. Turntable Speeds Heavy Scrap Cutting. *Welding Journal,* v. 31, May 1952, p. 421-422.
At Allegheny Ludlum Steel Corp., Brackenridge, Pa. (A5, G22, ST)

209-A. The Steel Industry of the World Under Great Stress. (In German.) Wilhelm Salewski. *Stahl und Eisen,* v. 72, Apr. 24, 1952, p. 453-459.
Economic analysis of expansion of the iron and steel industry throughout the world during the past 20 years. Graphs and tables. (A4, Fe, ST)

The coding symbols at the end of the abstracts refer to the ASM-SLA Metallurgical Literature Classification. For details write to the American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio.

210-A. Critical Nickel Situation Discussed at ODM-ASTM Meeting. *ASTM Bulletin,* May 1952, p. 48-49.
List of measures and substitutes to aid in Ni conservation. (A4, Ni)

211-A. Manganese in Open Hearth Slags is Largest Potential Domestic Source. *Chemical and Engineering News,* v. 30, June 2, 1952, p. 2300-2301.
Two tentative chemical-recovery processes: ammonium carbonate leaching; and treatment with chloride at a temperature that will volatilize Fe and Mn chlorides and leave behind gangue material.
(A8, Mn)

212-A. Contribution of Research to the Metallurgy of Cast Iron. Ralph V. Riley. *Foundry Trade Journal,* v. 92, May 15, 1952, p. 517-522.
Reviews established principles of testing methods for investigating the properties of cast iron, and achievements in cast iron research, including development of nodular cast iron. 11 ref. (A9, CI)

213-M. Monitoring Device for Use With an X-ray Diffraction Cylindrical Camera. M. S. Ahmed. *Journal of Scientifc Instruments,* v. 29, May 1952, p. 163-164.
A modified form of Goppel's camera, simpler to construct, and more siutable for use with a cylindrical film. (M22)

214-A. B. T. H. Research in 1951. *Metallurgia,* v. 45, May 1952, p. 251-252.
Brief references to some examples of metallurgical interest in British research laboratory. Creep of high-temperature alloys; welding techniques for turbine-rotor forgings; bonded silicides; magnetic sheet steel; machining research; infrared radiation pyrometer; and infrared photo-electric relays. (A9)

215-A. World Mine Zinc Output Expected to Exceed Smelter and Pigment Production This Year. Simon D. Strauss. *Metals,* v. 22, May 1952, p. 7, 9.
Data are tabulated. (A4, Zn)

216-A. Estimate Storage Battery Lead Consumption in 1952 at 388,048 Tons or 3.87% Over Last Year. R. L. Sommerville. *Metals,* v. 22, May 1952, p. 8, 15.
Industrial use may decrease 10%; in automotive field rise in government business will offset declines in other categories. (A4, Pb)

217-A. U. S. 120,000-Ton Slab Zinc Surplus in 1952 Seen Developing Entirely in Higher Grades. C. R. Ince. *Metals,* v. 22, May 1952, p. 9, 15.
(A4, Zn)

218-A. Abstracting Journals; a Comparative Survey. *Metals Review,* v. 25, May 1952, p. 6-7, 12-14. (Extracts from "The Technical Society as a Library Resource", by Marjorie R. Hyslop. *Transactions* of the 41st Annual Convention, Special Libraries Association, 1951, p. 106-119.)
Four metallurgical abstract services were analyzed on the basis of five aspects: kind of abstract, whether informative, or indicative; timeliness; selectivity; source material; and subject matter. The services analyzed are: ASM Review of Metal Literature; Metallurgical Abstracts (Institute of Metals); Abstracts of Current Literature (Iron and Steel Institute); and Chemical Abstracts. (A10)

219-A. Three More Letters on the Dispute Over More Aluminum From Alcan. *Modern Metals,* v. 8, May 1952, p. 50, 52, 54-55.
The question of whether additional aluminum should be obtained from Aluminum Co. of Canada or from further expansion of primary smelting capacity in this country. Letters are from Dewey Anderson, defending his booklet "Aluminum for Defense and Prosperity" against the criticism of Sam Moment; from Congressman Emanuel Celler addressed to Sam Anderson, head of

DPA's aluminum division; and from Arnold Troy of Eastern Metal Products Co. (A4, Al)

220-A. Average Analyses Lake Superior Iron Ores 1951 Shipments. *Skillings' Mining Review,* v. 41, June 7, 1952, p. 1-2.

Tabular data for tonnage shipments and average analyses of different types from each range. (A4, Fe)

221-A. The Outlook for Aluminum. David P. Reynolds. *Stove Builder,* v. 17, June 1952, p. 114, 116, 118, 120, 122, 124.

Ore deposits, production figures, and future markets. (A4, B10, Al)

222-A. Activities of the International Center for Development of Aluminum. (In French.) *Revue de l'Aluminium,* v. 29, Apr. 1952, p. 164-165.

Work of the various committees and the proposed program. Representatives of Germany, France, Italy, and Switzerland are included. (A9, Al)

223-A. The Iron and Steel Industry of Upper Silesia. (In German.) Karl Tanzer. *Stahl und Eisen,* v. 72, May 8, 1952, p. 569-574.

History and present status. (A2, A4, Fe, ST)

224-A. The Plating Wastes Problem from the Electroplater's Viewpoint. A. K. Graham and H. L. Pinkerton. *Plating,* v. 39, June 1952, p. 619-621.

Previously abstracted from *Sewage and Industrial Wastes;* see item 128-A, 1952. (A8, L17)

225-A. Annual Review—1952 Edition. *Mining Journal,* May 1952, 248 pages.

Contains a series of articles under each of the following headings: Review of the metals and minerals; mining and metallurgical developments during the year; the world's mining fields in 1951; and progress of the mining companies. Some individual articles are separately abstracted. (A general)

226-A. Review of the Metals and Minerals. *Mining Journal,* May 1952, p. 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29-31, 33, 35, 37, 39, 41, 43, 45-47, 49, 51, 53-55, 57, 59, 61.

A series of economic reviews for 1951 covering: Au, Ag, Pt metals, Cu, Sn, Pb, Zn, Al, Mg, Be, Sb, Ni, Co, Ti, Mn, W, Mo, Fe and steel, and some nonmetallic industries. (A4)

227-A. The World's Mining Fields in 1951. *Mining Journal,* May 1952, p. 107, 109, 111, 113, 115, 117, 119, 121, 123, 125, 127, 129-131, 133, 137-139, 141, 143, 145, 147, 149, 151, 153, 155, 157, 159.

A series of primarily economic reviews presented by country or geographical area. (A4, B10)

228-A. (Book) **Air Pollution: Proceedings of the United States Technical Conference on Air Pollution.** Louis C. McCabe, chairman. 847 pages. 1952. McGraw-Hill Book Co., 330 W. 42nd St., New York 18, N. Y.

97 papers subdivided as follows: 14 on agricultural aspects; 14 on analytical methods and properties; 24 on control equipment and procedures; 14 on health aspects; 14 on instrumental methods for investigation or recording of air pollutants; 9 on legislative aspects; and 8 on meteorological aspects. (A7)

229-A. (Book) **Basic Engineering Metallurgy.** Carl A. Keyser. 384 pages. Prentice-Hall, Inc., 70 Fifth Ave., New York 11, N. Y. $8.00.

Theories, principles, and applications of engineering metallurgy. Intended to serve, primarily, students in all branches of engineering. Mechanism of metal failure. Properties, applications, and fabrication of nonferrous metals. Advantages, limitations, and control of the various means of fabricating metals. Primary and secondary methods of mechanical working, joining, fabrication. (A general)

230-A. (Book) **A Century of Technology: 1851-1951.** Percy Dunsheath, editor. 346 pages. 1951. Hutchinson's Scientific and Technical Publications, 47 Princes Gate, London S. W. 7, England.

General plan of each chapter is to summarize 100 years of progress in a specific field, with an indication of outstanding events and personalities responsible for the progress. (A2)

231-A. (Book) **Die Metallwirtschaft der Schweiz und ihre Nebengebiete.** (The Swiss Metal Industry and Its Subsidiary Branches.) 120 pages. 1951. Verlag für Wirtschaftsliteratur G.m.b.H., Zurich 55, Switzerland.

Contains a list and index of all firms in the metal industry, arranged according to their specialized fields, such as iron and steel foundries, nonferrous metal foundries, commercial firms for various types of metal products, etc., and also a list of their professional organizations. (A10)

232-A. (Book) **Grundlagen der Metallkunde in anschaulicher Darstellung.** (Fundamentals of Metallurgy in Graphic Presentation.) Ed. 3. Georg Masing. 148 pages. 1951. Springer-Verlag, Berlin, Germany.

Basic facts of metallurgy and their relationship to technology. Atomic structure of metals and alloys, formation of solid solutions, thermal treatments, plastic deformation, stresses, recrystallization, and chemical behavior of metals toward nonmetallic corroding agents. Many charts, diagrams, and tables. (A general)

233-A. (Book) **Metall- und Legierungsregister.** (Handbook of Metals and Alloys.) Walter Krauskopf. 144 pages. 1950. Carl Hanser Verlag, Munich, Germany.

Lists in alphabetical order about 1800 old and new metals and alloys by terms and trade names. The metals are defined by composition and their uses, properties, and producer's names are indicated. (A10)

234-A. (Book) **V. E. Grum-Grzhimailo Cobranie Trudov.** (V. E. Grum-Grzhimailo's Collected Works.) I. P. Bardin, editor. 246 pages, 1949. Academy of Sciences of the USSR, Section of Technical Sciences, Moscow and Leningrad, U.S.S.R.

Collected writings of one of the founders of the metallurgical sciences in Russia. Published as a memorial on the occasion of the 12th anniversary of his death. (A2)

B

RAW MATERIALS AND ORE PREPARATION

210-B. Operation of the Creighton Mill of the International Nickel Company of Canada, Limited. *Canadian Mining and Metallurgical Bulletin,* v. 45, May 1952, p. 253-259; *Transactions of the Canadian Institute of Mining and Metallurgy,* v. 55, 1952, p. 163-169.

Construction and operation of new mill for low-grade Ni ore. Crushing, grinding, flotation, tailings disposal, and other features. Tables, diagrams, and illustrations. (B13, B14, Ni)

211-B. Iron Ore Supply: Present and Future. W. M. Goodwin. *Canadian Mining and Metallurgical Bulletin,* v. 45, May 1952, p. 267-270; *Transactions of the Canadian Institute of Mining and Metallurgy,* v. 55, 1952, p. 177-180.

A survey, especially for Canada. (B10, Fe)

212-B. Western Coking Coal Resources. T. G. Ewart. *Canadian Mining and Metallurgical Bulletin,* v. 45, May 1952, p. 264-265; disc., p. 266; *Transactions of the Canadian Institute of Mining and Metallurgy,* v. 55, 1952, p. 174-175; disc., p. 176.

A survey for both the U. S. and Canada. (B10)

213-B. Iron Ore: Brazil Pecks Away at Vast Blue Lode. W. V. Packard. *Iron Age,* v. 169, May 15, 1952, p. 67-69.

Current status in the development of the Caué Peak hematite deposits in central Minas Gerais which run 69% Fe and hold up to 25% of world's ore reserves. Area now ships 1.5 million tons annually. (B10, Fe)

214-B. Surface Oxidation of Galena in Relation to Its Flotation as Revealed by Electron Diffraction. Hitosi Hagihara. *Journal of Physical Chemistry,* v. 56, May 1952, p. 610-615.

Initial oxidation of galena surfaces was studied in air, in an enclosed atmosphere in galena powder, in a vacuum furnace, in water, and during dry and wet grinding. Electron diffraction examination of the oxidized faces showed that the lowest oxidation product is, in all cases, $PbSO_4$. In no instance were crystalline carbonate, hydroxide or the lower sulfoxides observed. Orientation relations and crystal growth. Graph and electron-diffraction patterns. 35 ref. (B14, Pb)

215-B. Mono- and Multilayer Adsorption of Aqueous Xanthate on Galena Surfaces. Hitosi Hagihara. *Journal of Physical Chemistry,* v. 56, May 1952, p. 616-621.

Action of aqueous xanthate on galena surfaces was studied by electron diffraction. Its primary function on both fresh and slightly oxidized faces lies in formation of minute monomolecular patches adsorbed on the galena lattice. Suggests that the monolayer is composed of xanthic acid molecules adsorbed with their polar heads attached to Pb atoms of the galena lattice. The layer is unstable in air. Schematic drawings and electron diffraction patterns. 21 ref. (B14, P13, Pb)

216-B. Collector-Depressant Equilibria in Flotation. I. Inorganic Depressants For Metal Sulfides. II. Depressant Action of Tannic Acid and Quebracho. George A. Last and Melvin A. Cook. *Journal of Physical Chemistry,* v. 56, May 1952, p. 637-648.

Part I: The "bubble pick up" method of Cooke and Digre was employed to obtain comprehensive equilibrium data for the system potassium n-amylxanthate-sodium sulfite—galena at 25° C. Mechanism developed was found to give a complete and self-consistent correlation of experimental results of this study together with results for 16 other similar systems studied by Wark. Part II: The systems galena—n-amyl xanthate—tannic acid and galena—n-amyl xanthate—quebracho were investigated, and the data interpreted by the single-site model for hydrolytic (free-acid) collector-depressant adsorption. Tables, graphs and 24 ref. (B14)

217-B. The Third Theory of Comminution. Fred C. Bond. *Mining Engineering,* v. 4, May 1952; *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 193, 1952, p. 484-494.

Development, proof, and application of theory which should eliminate the objections to the two old theories and serve as a practical unifying principle for comminution in all size ranges. 11 ref. (B13)

218-B. Deleading Zinc Concentrate at the Parral and Santa Barbara Mills. C. L. Boeke and G. G. Gunther. *Mining Engineering,* v. 4, May 1952; *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 193, 1952, p. 495-498.

Zinc deleading processes at above mills of Cia. Minera Asarco, S.A., Chihuahua, Mexico, are described separately to provide a basis for comparison. Emphasis is on flotation procedures. (B14, Zn)

219-B. Screened Ore Used for Fine Grinding at Lake Shore Mines. Bunting S. Crocker. *Mining Engineering,* v. 4, May 1952; *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 193, 1952, p. 499-508.

Method of substituting screened rock for steel grinding balls used by Lake Shore Mines, Ltd., Kirkland Lake, Ont., Canada. Results of various tests; reasons for changeover. Tabular data, graphs, and diagrams. (B13)

220-B. Iron Ore in the Sahara. *Times Review of Industry,* v. 6, May 1952, p. 88.

A group representing French, Canadian and British mining and metallurgical interests has recently formed a company to exploit rich and extensive iron-ore deposits on the western edge of the Sahara Desert. The ore lies in the vicinity of Fort Gouraud, in Mauritania. (B10, Fe)

221-B. Utilization of Manganese in Special Steels. (In English.) *Aciers fins et Speciaux Francais,* Mar. 1952, p. 33-38.

French practice in the above, details of compositions for different purposes, also properties in a general way. (B22, AY, SS, Mn)

222-B. Manufacture and Utilization of Crush-Resistant Pumice Slags. (In German.) Rudolf Kley. *Stahl und Eisen,* v. 72, Apr. 1952, p. 500-502.

Development of pumice-slag manufacture. Properties of pumice-slag and advantages of the types having strong grains. Possibilities of application. Proposals for increasing its sale. Sulfur in blast-furnace slag and its significance. (B21, D1, ST)

223-B. Theory of Grinding of Minerals. III. Separation of Particles of Coarsely Ground Products Into Two Fractions. (In Russian.) B. M. Zviagin, O. M. Todes, and A. Z. Iurovskii. *Izvestiia Akademii Nauk SSSR,* Section of Technical Sciences, Dec. 1951, p. 1825-1840.

Mathematical analysis plus graphical interpretation. (B13)

224-B. Computation of Mill Recovery. M. P. Legoux. *Bulletin of the Institution of Mining and Metallurgy,* May 1952; *Transactions,* v. 61, pt. 8, 1951-52, p. 410-414.

Discussion of above paper by C. C. Dell. (Dec. 1951 issue.) See item 45-B, 1952. (B14)

225-B. Tests To Determine a Method of Treatment of a Complex Gold Ore From Tarcoola, South Australia. *Commonwealth Scientific and Industrial Research Organization and Kalgoorlie School of Mines,* Ore Dressing Investigation Report 461, July 4, 1951, 25 pages.

Details of test results on three samples are tabulated and conclusions summarized. Flotation, gravity construction, amalgamation, and cyanidation were employed. Recovery of Au is emphasized. Recovery of Pb or Cu is of doubtful economic merit. (B14, C24, C29, Au)

226-B. Sinter Production Tied to Plant Design. Martin L. Cover. *Iron Age,* v. 169, June 5, 1952, p. 145-149.

Discusses conditions for maximum production of highest quality sinter, based in part on analysis of sections of the sinter bed of a 6-windbox machine. (B16, Fe)

227-B. Refractories Symposium. *Iron and Steel Engineer,* v. 29, May 1952, p. 79-85; disc., p. 85-87.

"Experiences With Castable and Rammed Refractories", J. E. Deegan; "Application of Rammed Castable Refractories in Steel Mills", Robert R. Fayles; "Experiences With Refractory Concrete", William N. Horko; "Advantages of Rammed and Cast Refractories for Steel Plant Use", R. E. Wolfensperger. (B19, ST)

228-B. On the Emulsification of the Flotation Reagents. (In English.) Tadashi Oyama and Sakae Tanaka. *Japan Science Review,* v. 2, Apr. 1951, p. 87-88.

Previously abstracted from *Science Reports of the Research Institutes, Tohoku University;* see item 81-B, 1952. (B14)

229-B. Thermodynamic Calculation of Slag Equilibria. H. Flood and K. Grjotheim. *Journal of the Iron and Steel Institute,* v. 171, May 1952, p. 64-70.

The equilibrium constant of reactions in molten slags, expressed in terms of ion concentrations, is shown to be frequently influenced by concentrations that do not enter into the formal equilibrium equation. A simple thermodynamic relation is derived between equilibrium constant and concentrations of ions not entering into the equilibrium equation. 10 ref. (B21, P12)

230-B. The Agglomeration of Taconite Concentrate. Marvin A. Kunde. *Mines Magazine,* v. 42, May 1952, p. 39-42.

With special reference to Northern Minnesota taconite. The current status of pelletizing, sintering, nodulizing, and briquetting. (B16, B17, Fe)

231-B. Pneumatic Flotation Equipment. Frank H. Slade. *Mining Journal,* v. 238, May 23, 1952, p. 530-532.

Low-pressure air provides for maximum bubble attachment in modern flotation equipment used in the treatment of metallic ores, nonmetallic minerals and many other materials. Operation of various types of machines in current use. Diagrams. (B14)

232-B. Centrifugal Separation at a Fluid Boundary. D. Tedman. *Mining Magazine,* v. 86, May 1952, p. 274-276.

Discovery which led to the development of a continuous separating machine for ore fractions. Laboratory apparatus is diagrammed. Separation of galena and sphalerite. (B14)

233-B. The Tsumeb Story. Part II. Tsumeb Mill Uses Five Flotation Circuits For Copper, Lead, Zinc Oxide and Sulphide Ores. J. N. Ong. *Mining World,* v. 14, June 1952, p. 34-39.

Details of crushing, grinding, and concentration flowsheets, equipment, and procedures of above mill, located in Southwest Africa. Products are Cu, Pb, and Zn concentrates. (B14, Cu, Pb, Zn)

234-B. Factors Affecting Flotation. Part II. (Concluded.) H. J. Gisler. *Pit and Quarry,* v. 44, Apr. 1952, p. 109-112.

Methods of introducing air, kind of gas used to form bubbles, removal of concentrates, types of flotation machines, and applications to metals and nonmetals. (B14)

235-B. Blast Furnace Practice. X. Beneficiation of Raw Materials. Charles E. Agnew. *Steel,* v. 130, May 19, 1952, p. 106, 108, 111, 114, 116, 118, 121-122, 124, 127.

Treating natural iron ores, ore concentrates, and flue dust. Sintering, nodulizing, briquetting, and pelletizing. Fuel beneficiation. (To be continued.) (B16, B17, Fe)

236-B. Treatment Tests of Scheelite Ores and Tailings. A. L. Engel. *U. S. Bureau of Mines,* Report of Investigations 4867, Apr. 1952, 11 pages.

A compilation of results of preliminary tests on scheelite (tungsten) ores and tailings. These investigations were made to assist in establishing satisfactory treatment methods for small-scale concentrator operations, or to indicate a method for conserving previously lost mineral values in old tailings. (B14, W)

237-B. Selective Flotation of Metals and Minerals. (In German.) J. H. Schulman and T. D. Smith. *Kolloid Zeitschrift,* v. 126, Apr. 1952, p. 20-32; disc., p. 32-35.

Fundamental principles. Experimental methods of studying different metals and minerals under different conditions. Diagrams, graphs, and tables. 13 ref. (B14)

238-B. Secondary Utilization of Excess Blast Furnace Gas in Metallurgical Plants. (In Russian.) S. I. Moiseevich. *Za Ekonomiiu Topliva,* v. 9, Mar. 1952, p. 4-8.

Use of buffer boiler installations which will automatically adjust the consumption of blast-furnace gas to pressure in the gas system, thus preventing some of the waste that occurs due to variations of its production and use. (B18)

239-B. High Quality Sinter From Lean Iron Ores. D. W. Gillings. *Blast Furnace and Steel Plant,* v. 40, June 1952, p. 663-668, 670-671.

Reviews recent technical advances in the sintering of British ores; background and techniques of individual researches. Tables, graphs, and photographs. (B16, Fe)

240-B. The Upgrading of Minerals, With Special Reference to Coal. E. M. Myers. *Chemistry & Industry,* Mar. 29, 1952, p. 278-286.

Includes brief discussion of treatment methods for a variety of metal ores. History, gravity methods, and froth flotation for coal upgrading. Diagrams. (B14, B18)

241-B. How to Measure Retention Time in Flotation Machines. T. M. Morris. *Engineering and Mining Journal,* v. 153, June 1952, p. 91.

Procedure used at London mill of Tennessee Copper Co. to compare retention times in the bulk rougher and scavenger circuits, and to compare average retention time of water and solids in the bulk rougher circuit. (B14)

242-B. Metal Economics. I. Primary Resources of Ferrous and Non-Ferrous Metals. A. J. Murphy. **The World Supply of Non-Ferrous Metals, Including the Light Metals.** R. Lewis Stubbs. **Metals as Natural Resources.** S. Zuckerman. **World Demand and Resources of Iron Ore.** T. P. Colclough. *Journal of the American Society of Naval Engineers,* v. 64, May 1952, p. 259-280. Reprinted from *Journal of the Institute of Metals;* see item 74-B, 1952. (B10, A4)

243-B. Impact Crushing for Reduction of Hard-Abrasive Ores. W. W. West. *Mining Engineering,* v. 4, June 1952, p. 563-564.

Theory and its relation to attrition crushing. Design and operation of impactors. (B13)

244-B. Jacksonville Plant Produces Titanium From Beach Deposit. J. C. Detweiler. *Mining Engineering,* v. 4, June 1952, p. 560-562.

Operations at the Jacksonville plant of Humphreys Gold Corp., which recovers rutile, ilmenite, zircon, and monazite from an ancient beach deposit containing about 2.5% of these minerals in combination. (B14, Ti)

245-B. A Review of Mineral Dressing. F. B. Michell. *Mining Journal,* May 1952, p. 75, 77, 79, 81, 83.

Review for 1951 of crushing; grinding; screening; classification; heavy media separation; gravity concentration; washing and scrubbing; flotation; electrostatic separation; and hydrometallurgy.
(B general)

246-B. Progress of Mining in the United States. *Mining Journal,* May 1952, p. 89-91, 93.

Concerns the year 1951 and includes brief notes on ore dressing, and hydro and extractive metallurgy. (B12, B14, C general)

247-B. Factors Affecting Flotation. Part II. (Concluded.) H. J. Gisler. *Pit and Quarry,* v. 44, Apr. 1952, p. 109-112.

Methods of introducing air, kind of gas used to form bubbles, removal of concentrates, types of flotation machines, and applications to metals and nonmetals.

248-B. Natural Draft and Forced Draft. (In French.) J. E. Lafon. *Metallurgie et la Construction Méchanique,* v. 84, Mar. 1952, p. 175, 177, 179, 181; Apr. 1952, p. 251, 253, 255.

Compares the two systems as applied to industrial furnaces, especially the regenerative type. Schematic diagrams illustrate principles. (To be continued.) (B18)

249-B. (Book) **Manual of ASTM Standards on Refractory Materials.** Rev. ed. 306 pages. 1952. American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa. Cloth, $3.65; paper $3.00.

Supersedes 1948 ed. Brings together all of the ASTM standard and tentative specifications, classifications, methods, and definitions pertaining to refractories. Includes surveys of refractory service conditions in the malleable iron industry and lead industry; and methods of test for modulus of rupture and for permanent linear change on firing of castable refractories. Test methods cover fireclay refractory brick; mortars and fireclay plastic and castable refractories; and insulating fire brick. (B19)

C

NONFERROUS EXTRACTION AND REFINING

88-C. The Electrochemistry of Nickel. W. A. Wesley. *Industrial and Engineering Chemistry,* v. 44, May 1952, p. 957-965.

Present knowledge, both scientific and practical, of the electrochemical reactions of Ni as they find application in industry today. Evidence is cited to show that it is possible to electrodeposit sound Ni metal at speeds much higher than have yet been employed commercially. Industrial processes discussed include electrorefining, electroforming, electroplating, resizing of mismachined parts, and electropolishing. 20 ref. (C23, L13, L17, L18, Ni)

89-C. Some Aspects of Titanium Metallurgy. W. J. Kroll. *Metal Industry,* v. 80, May 2, 1952, p. 343-345; May 9, 1952, p. 383-386, 388.

Primarily devoted to chemistry as a basis for Ti production methods. Detailed discussion of a table of physical properties of Ti compounds. The more common reducing agents, their chlorides, and fluorides. Possibilities of Ti reduction by means of various metals indicating process involved, feasibility, kind of metal obtained, and disadvantages. 23 ref. (C26, C4, Ti)

90-C. Pure Metals From Ore Concentrates. *Steel,* v. 130, May 26, 1952, p. 76-77.

See abstract of "Chemical Ore Reduction Process May Pay Out in Three Years", *Chemical and Engineering News;* item 78-C, 1952.
(C general, B14, Ni, Co, Cu, Mn)

91-C. Role of the Aggregation State of Hard-to-Reduce Oxides During Their Reduction by Carbon in Industrial Furnaces. (In Russian.) A. S. Mikulinskii. *Zhurnal Prikladnoi Khimii,* v. 24, Dec. 1951, p. 1235-1245.

Various problems connected with the production of materials such as Si from SiO_2. The vapor stage of SiO was found to be very important. 16 ref. (C21)

92-C. Chemical Treatment of Molten Non-Ferrous Metals. Part 1. D. A. Dodson. *Canadian Metals,* v. 15, May 1952, p. 32, 34-35, 64.

Chemical treatment for removal of impurities, improvement of castability, adjustment or control of alloy compositions, and improvement of physical properties of the Cu alloys. (C21, C5, Cu)

93-C. Electric Furnace Smelting of Zinc Ores; the Sterling Process. E. C. Handwerk, G. T. Mahler, and L. D. Fetterolf. *Journal of Metals,* v. 4, June 1952, p. 581-586.

New process by which Zn metal, together with its accompanying values, and pig iron, are produced. All of these elements except for a controlled amount of iron are almost completely eliminated from the slag. It has been used on high-grade Zn concentrates from which substantial recovery of secondary values can be realized. The Pb, Cd, and some of the Ag, are collected in the Zn metal, while Cu, Au, and the remaining Ag are concentrated in the pig iron.
(C21, Zn, Pb, Cd, Cu, Au, Ag, Fe)

94-C. New Chemical Method Recovers Nickel, Cobalt, Copper Metal. *Journal of Metals,* v. 4, June 1952, p. 589-591.

See abstract of "Chemical Ore Reduction Process May Pay Out in Three Years", *Chemical and Engineering News;* item 78-C, 1952.
(C general, B14, Ni, Co, Cu, Mn)

95-C. Melting of Undoped Silicon Ingots. J. Hino and H. E. Stauss. *Journal of Metals,* v. 4, June, 1952; *Transactions of American Institute of Mining and Metallurgical Engineers,* v. 194, 1952, p. 656.

Preparation of Si in bulk form. The usual method involves use of selected added constituents as "doping" agents. Two basic problems in producing Si ingots free of doping additions: prevention of spitting and prevention of cracking of the ingot during freezing. (C5, Si)

96-C. Continuous Casting and Rolling Venetian Blind Slat Stock. *Modern Metals,* v. 8, May 1952, p. 45-48.

The machine at Hunter Douglas Corp.—particularly the casting unit —is well adapted to the mass production of many other Al products. Melted ingots are poured into horizontal bars of any desired length, then continuously rolled into ⅛-in. thick strip. Mechanized surface-preparation and painting installation. (C5, F23, L26, Al)

97-C. Removal of Impurities From Tin by Vacuum Distillation. J. W. Price. *Nature,* v. 169, May 10, 1952, p. 792.

Procedure to produce extremely pure tin. A specimen was heated in an evacuated silica tube at 1000° C. for 4 hr., after which spectrographic examination showed As, Sb, Pb, and Bi to be absent. A colorimetric method showed the As content to be less than 0.0002%. (C25, Sn)

98-C. Preparation of Silicon by Aluminothermic Methods. (In French.) Jean de Postis and Raymond Muraire. *Bulletin de la Société Chimique de France,* Mar.-Apr. 1952, p. 282.

Development of a laboratory procedure in which silica is reduced by a mixture of S and Al (C26, Si)

99-C. Magnesium Makers Take on Steam. *Canadian Chemical Processing,* v. 36, June 1, 1952, p. 34, 36-37.

Increase in Aluminum Co. of Canada's Mg production facilities, soon expected to be four times greater. Extraction processes.
(C general, Mg)

100-C. Is the Chemico Metals Technique Tomorrow's Metallurgy? Howard L. Waldron. *Engineering and Mining Journal,* v. 153, June 1952, p. 84-87, 176.

See abstract of "Chemical Ore Reduction Process May Pay Out in Three Years", *Chemical and Engineering News,* item 78-C, 1952.
(C general, B14, Ni, Co, Cu, Mn)

101-C. Advances in Extraction Metallurgy. Graham Oldham. *Mining Journal,* May 1952, p. 85-87.

Brief reviews for 1951 covering the following: Al, Cu, Ga, Ge, Au, Pb, Li, Mn, W, Zn, and Zr. 23 ref. (C general)

102-C. Developments in Production of Alloys. A. E. Williams. *Mining Journal,* May 1952, p. 97-100.

A review for 1951 for the following alloys or alloy materials: alloy steels, Mn, Cu, bronzes, carbides, and Al-base alloys.
(C general, D general, AY, Mn, Cu, Al)

103-C. Modern Design Principles in Pyro-Processing. Part I. Heat Transfer Classifications, Pre-heating. Wolf G. Bauer. *Pit and Quarry,* v. 44, May 1952, p. 116-124, 126-127.

Equipment classification based on heat transfer principles. Design of equipment from a processing standpoint, rather than that of mechanics. Equipment is applicable to a wide variety of metallic and nonmetallic minerals. Flow diagrams and table. (To be continued.)
(C21, D general)

D

FERROUS REDUCTION AND REFINING

242-D. Some Aspects of the Blast Furnace Situation in the United States. Owen R. Rice. *Blast Furnace and Steel Plant,* v. 40, May 1952, p. 513-521.

Previously abstracted from *Journal of the Iron and Steel Institute.* See item 140-D, 1952. (D1, A4, Fe)

243-D. Conservation and the Open Hearth. F. F. Franklin. *Blast Furnace and Steel Plant,* v. 40, May 1952, p. 522-524.

How conservation affects the composition of steels and how it affects materials and supplies for steel production. Changes in practice required by the new steels and by shortages of materials. (D2, ST)

244-D. Hydrogen as an Additional Reducing Agent to Coke in the Blast Furnace. J. L. Boyle. *Blast Furnace and Steel Plant,* v. 40, May 1952, p. 535-537.

Suggests use of H_2, either pure or mixed with hydrocarbons in coke-oven gas, as an additional reducing agent besides coke. Reduction in coke consumption might be achieved. Theory and probable effects. Shows that the suggestion is

not in conflict with the present trend toward oxygen enrichment. (D1, Fe)

245-D. Some Refractories Problems in Steelworks. G. Reginald Bashforth. *Refractories Journal,* v. 28, Apr. 1952, p. 142-156; disc., p. 157-160.
(D general, ST)

246-D. Relighting of Blast Furnaces Under Particularly Difficult Conditions. (In French.) Paul Thierry. *Métallurgie et la Construction mécanique,* v. 84, Mar. 1952, p. 153, 155-157; Apr. 1952, p. 217, 219.

Relighting of furnaces at a French steel mill which were shut down without any preparation. The tuyeres were entirely blocked. Tables show materials used. (D1, Fe)

247-D. Pre-Refining by Means of Pure Oxygen of Bessemer Melts of High Silicon Content. Application to Bessemer Melts Produced in the Acid Blast Furnace. (Concluded.) (In French.) P. Leroy. *Revue de Métallurgie,* Apr. 1952, p. 299-320.

Problems involved in blast-furnace processing of several French iron ores. Various possible solutions. Increase of temperature of the melt due to prerefining, specific heat of the liquid melt, comparison of physicochemical characteristics of castings; and tests on oxygen blowing into the stream of molten metal leaving the blast furnace. Extensive tables and graphs. 23 ref.
(D1, D3, ST)

248-D. Production of Sponge Iron by Means of the Wiberg-Söderfors Process. (In German.) John Stalhed. *Stahl und Eisen,* v. 72, Apr. 24, 1952, p. 459-465; disc., p. 465-466.

Present status of raw-materials situation in the Swedish iron and steel industry. Development of process and the plant at Söderfors. Different methods for gas generation, the raw materials balance, sulfur removal, reducing agents, requirements as to ores, economic factors, applications of sponge iron, and future plans. Diagrams, graphs, and tables. (D8, Fe)

249-D. Rammed Openhearth Bottoms Increase Production. Charles Heilig. *Iron Age,* v. 169, June 5, 1952, p. 133-137.

Construction of bottoms at Jones & Laughlin Steel Corp., Pittsburgh, which saves 3-5 days in getting each furnace into operation. Diagrams.
(D2, ST)

250-D. O. H. Combustion Problems; Experimental Furnace For Their Investigation. Part V. The Venturi Port and Modifications. J. F. Allen. **Part VI. Summary of Results and Their Application in Practice.** J. R. Hall and A. H. Leckie. *Iron & Steel,* v. 228-233; disc., p. 256-259.

Previously abstracted under similar title from *Journal of the Iron and Steel Institute.* See item 93-D, 1952, p. 37-48. (D2, ST)

251-D. Air Infiltration; Measurement in Open-Hearth Furnaces. R. Haynes. *Iron & Steel,* v. 25, May 17, 1952, p. 234-235; disc., p. 259-261.

Previously abstracted under similar title from *Journal of the Iron and Steel Institute.* See item 145-D, 1952. (D2)

252-D. Wear of O. H. Roofs; Aerodynamic Factors Involved. J. A. Leys and E. T. Leigh. *Iron & Steel,* v. 25, May 17, 1952, p. 236-239; disc., p. 259-261.

Previously abstracted under similar title from *Journal of the Iron and Steel Institute.* See item 225-D, 1952. (D2, ST)

253-D. Surface Defects in Steel and Their Relationship to the Different Stages of the Manufacturing Process. T. Dennison. *Journal of the Electrodepositors' Technical Society,* v. 27, 1950, p. 35-41; disc., p. 42-44. (Preprint.)

Manufacture and fabrication of steel, including hot and cold rolling. Relates the various stages in the manufacture of steel to formation of surface defects which largely determine ease of polishing and freedom from porosity of electrodeposit. Macrographs.
(D general, F23, L17, ST)

254-D. Some Further Experiments With Rimming Ingots. D. Binnie. *Journal of the Iron and Steel Institute,* v. 171, May 1952, p. 71-74.

Analysis of 2-ton ingots of rimming steel cooled in refractory-lined molds shows that these larger ingots have similar features to those of the smaller 3-cwt. ingots examined previously, except that there was a general rise in impurities toward the axis of the larger ingots. They differ from ingots made in conventional hematite molds, having no peak value of the impurities at the rim-core junction and no clear indication of minimum values in the rim itself. This shows a need for revision of existing theories. 11 ref. (D9, ST)

255-D. Flow Visualization in Open-Hearth Furnace Models. J. A. Leys. *Journal of the Iron and Steel Institute,* v. 171, May 1952, p. 86.

Use of balsa dust. The model can then be illuminated and the flow patterns photographed. (D2, ST)

256-D. Electrode Economy in Electric Arc Furnaces for Steelmaking. R. Toye and D. I. Bell. *Journal of the Iron and Steel Institute,* v. 171, May 1952, p. 86.

Influence of physical properties on electrode quality, and of electrode diameter on electrode consumption. Effects of sheet-metal sleeving and of sprayed Al coatings. (D5, ST)

257-D. Hot Metal Mixer Linings—Mixer Linings at Columbia-Geneva Steel Div. R. E. Aikens. *Journal of Metals,* v. 4, June 1952, p. 587-588.

Experiences of Columbia-Geneva Steel Div. and Clairton Works, U. S. Steel Co. Service life and metal tonnage were increased. (D1, ST)

258-D. Mixer Linings at Clairton Works. F. R. Smith. *Journal of Metals,* v. 4, June 1952, p. 588.

Experiences of past four years.
(D1, ST)

259-D. Effect on Production Rates of Foreign Ores as Open Hearth Charge Ore: Liberian Ore. R. P. Carpenter. **Moroccan Ore.** C. C. Benton. *Journal of Metals,* v. 4, June 1952, p. 592-593.

Experiences of Republic Steel Corp. with Liberian ore. Use of Moroccan ore by Fairfield Steel Works, Tennessee Coal & Iron Div., U. S. Steel Co. Data are tabulated.
(D2, ST)

260-D. Solidification of Castings. *Metal Industry,* v. 80, May 16, 1952, p. 406-409; May 23, 1952, p. 427-429; disc., p. 429.

Papers presented at University of Birmingham Industrial Metallurgy Dept. Conference. "Basic Theory of Heat Transfer in Moulds", F. L. Daws; "Application of Heat Transfer Theory to Ingot Casting", J. J. Pick; "Application of Heat Flow Theory to Sand Castings", G. Martin. 64 ref. (D9, C5, E25)

261-D. Metallurgy in the Carbon-Rod Radiant-Resistor Furnace. *Metal Treatment and Drop Forging,* v. 19, May 1952, p. 197-202. (Translated and condensed from "Metallurgy in the Graphite-Bar Furnace", W. Gödecke, *Giesserei.*)

Previously abstracted from original. See item 198-D, 1951.
(D2, E10, ST, CI, SS)

262-D. Blast-Furnace Dust on the Heating Surfaces of Heat Exchangers. (In German.) Alberts Upmalis. *Brennstoff-Wärme-Kraft,* v. 4, May 1952, p. 159-161.

Two experimental plants were used to investigate effects of dust on performance of heat exchangers, melting points of dust, heat conduction, and means of combating formation of dust deposits. Photographs, diagrams, and tables.
(D1, Fe)

263-D. The Hot Blast Cupola and Its Metallurgical Applicability. (In German.) Kurt Guthmann. *Stahl und Eisen,* v. 72, May 8, 1952, p. 545-556.

The cold blast cupola as a premelting plant for the steelworks. Development of the hot-blast cupola and its place in metallurgical processes. Range of production. Behavior of C, Si, Mg, P, and S. The basic-lined, hot blast cupola. Raw materials charged. Remelting of pig iron, blown in acid blast furnaces with addition of domestic ores, in the hot blast cupola for charging to the basic converter. Premelted metal from steel scrap, sintered ore, etc., as a liquid charge for openhearth furnaces. Diagrams, tables, graphs, and illustrations. 48 ref.
(D7, Fe, ST)

264-D. Influence of the Hot Blast Cupola Operation on the Economy of Openhearth Steel Ingot Production. (In German.) Gottfried Prieur. *Stahl und Eisen,* v. 72, May 8, 1952, p. 556-561.

Situation of steel-ingot production at the end of 1950. Fundamental tendencies of further development. Prime cost of iron from the hot blast cupola. Influence of charge and processing costs of openhearth steel on furnace efficiency, output, and steel ingot production capacity. Tables and graphs. (D2, ST)

265-D. Peculiarities of Slag Conditions During Melting of Ferro-Mangano-Phosphorus. (In Russian.) A. L. Zagianskii. *Doklady Akademii Nauk SSSR,* new ser., v. 83, Mar. 11, 1952, p. 265-267.

A study was made of the changes of viscosity and composition of blast-furnace slag during the production of this material. Data are tabulated. (D1, B21, Fe-n, ST)

266-D. The Construction of Uniflow Steel Melting Furnaces. (In Russian.) M. A. Glinkov. *Za Ekonomiiu Topliva,* v. 9, Feb. 1952, p. 25-27.

The uniflow process in openhearth furnaces as a means of increasing production and simplifying operation. (D2, ST)

267-D. Recuperative Steel Furnaces. (In Russian.) E. A. Nitskevich. *Za Ekonomiiu Topliva,* v. 9, Feb. 1952, p. 28-29.

The construction of this type of steel furnace and its advantages over usual openhearth furnaces.
(D2, ST)

268-D. The Abbey Works of the Steel Company of Wales. *Blast Furnace and Steel Plant,* v. 40, Apr. 1952, p. 421-428; May 1952, p. 525-530; June 1952, p. 680-682, 709, 714-715. (Reprinted from *Engineering.*)
(D general, ST)

269-D. Refractories for the Basic Open Hearth Furnace and Auxiliary Equipment. Ernest B. Snyder. *Blast Furnace and Steel Plant,* v. 40, June 1952, p. 651-656.

The refractories used at the present time, service conditions, and possible furnace developments in improved refractories. (D2)

270-D. Electric Furnace Melting for Steel Castings. John Howe Hall. *Foundry,* v. 80, June 1952, p. 132-133, 276-283.

Second of three articles. Concludes discussion of basic electric furnace practice and takes up the acid electric process with special reference to oxidation, Si reduction, and Al use. Tables and photographs. (To be concluded.) (D5, CI)

271-D. Fundamental Investigation of Steel Plant Refractories Problems. II. The System $CaO\text{-}FeO\text{-}Al_2O_3\text{-}SiO_2$. Arnulf Muan and E. F. Osborn. *Industrial Heating,* v. 19, May 1952, p. 905-906, 908, 910, 912, 944, 946, 948.

A study in the basic, or low-silica part of the above system. (To be continued.) (D general, B19, ST)

272-D. Forge Shop Installs Compact Steel Melting Plant. D. I. Brown. *Iron Age,* v. 169, June 12, 1952, p. 119-123.

Plant layout of A. Finkl & Sons' Co. new Chicago electric-furnace melt shop for carbon and alloy steels. Some ultramodern features are a 35,000-cu. ft. Dri-Ox oxygen plant and a direct-reading spectrograph. Photographs and floor-plan diagram. (D5, S11, CN, AY)

273-D. Blast Furnace Practice. XI (a-c). Beneficiation of Air. Charles E. Agnew. *Steel,* v. 130, June 2, 1952, p. 102, 104, 106, 109, 112, 115, 118, 121; June 9, 1952, p. 106, 108, 111-112, 114, 117, 120, 122; June 16, 1952, p. 142, 144, 146.

June 2: Factors that influence the value of dry and moist blast on furnace operating economy, and relationship between high-pressure blowing and raw materials. June 9: How control of temperature head in the lower bosh permits successful use of oxygen without disturbing temperature balance in the shaft raw-material-preparation operation. June 16: Importance of effects of raw material, chemical composition and blowing rate on the raw-material preparation capacity of the shaft. (To be continued.) (D1, Fe)

274-D. (Book) **Die Edelstahlerzeugung Schmelzen, Giessen, Prüfen.** (Production of High-Quality Steel.) Franz Leitner and Erwin Plöckinger. 490 pages. 1950. Springer-Verlag, Vienna, Austria. $14.50.

The fundamentals of metallurgical reactions and their relationship to industrial experiences. Reviews the theoretical basis of metallurgy, the solidification process, and the practical side of production and casting. A special chapter treats control of the melt. Data are extensively charted and tabulated.
(D general, E general, ST)

275-D. (Book) **Elektrostahl-Erzeugung** (Electric Steel Manufacture). Franz Sommer and Hans Pollack. 334 pages. Verlag Stahleisen m.b.H., Düsseldorf, Germany. 34 DM.

The theory and practice of steelmaking in arc and induction furnaces. Fundamental electrical principles involved. Refractories and insulation. Materials and construction of electric furnaces. Operation of the furnace, metallurgical reactions involved, and raw materials used, are discussed generally; operation of the various types of furnaces is described at length, including duplexing and semiduplexing and other special processes. Economics of steelmaking in electric furnaces. 200 ref. (D5, ST)

276-D. (Book) **Raschet Domennykh Shikht.** (Calculation of Blast-Furnace Charges.) M. A. Pavlov. 258 pages. 1947. Government Scientific-Technical Publishing House for Literature on Ferrous and Nonferrous Metallurgy, Moscow, U.S.S.R.

Method of determination of the relationship between ores charged, fluxes, and fuel ash content, so that the type of iron obtained will correspond to the proper amount of slag of required properties. How these ratios are expressed during preparation of charges for different types of iron and calculation methods to be applied in each case. (D1, Fe)

E

FOUNDRY

370-E. Ways and Means to Increased Productivity. John Hunter. *Foundry Trade Journal,* v. 92, May 1, 1952, p. 457-462.

General factors affecting productivity in the foundry industry. Major influences and means for improvement. Patterns, molding boxes, manual effort, roller-track, overhead hoppers, sandslingers, and rubbish disposal. Interrelation with plant utilization. Tables, graphs, and diagrams. (E general, A5)

371-E. Job Foundry Tackles Shell Mold Production. G. Palmer Derby. *Iron Age,* v. 169, May 15, 1952, p. 109-113.

Shell-mold castings of gray and ductile iron were successfully produced in a pilot-plant operation at Lynchburg Foundry Co., Lynchburg, Va. Two men handle all operations on the four-station machine used to produce the molds. (E16, CI)

372-E. Core Maker Uses Ultramodern Controls. Leon F. Miller. *Iron Age,* v. 169, May 15, 1952, p. 114-117.

Automatic electric timers, solenoid air valves, and air cylinders control the Osborn Mfg. Co.'s core-making machine. Operated by two men. Production of over 300 cores per hour has been recorded. Diagrams and photographs. (E21)

373-E. C. I. Swarf; Effective Use in the Cupola. *Iron & Steel,* v. 25, May 1952, p. 161-162.

Process developed by a British firm. (E10, CI)

374-E. Gas and Shrinkage Porosity in Castings. II. *Metal Industry,* v. 80, May 9, 1952, p. 389.

The conception of Whittenberger and Rhines that voids and pores are formed by a process of nucleation and growth during the freezing of castings. Confined to Mg and Mg-Al alloys. (E25, Mg, Al)

375-E. Casting Redesign May Result in Multiple Savings. *Steel,* v. 130, May 26, 1952, p. 78.

An example of foundry engineering methods where redesign of tractor drive spacer steel castings resulted in simplified production.
(E11, CI)

376-E. Modern Electric Furnaces in Light-Alloy Foundries. (In French.) Raymond Guillemot. *Fonderie,* Apr. 1952, p. 2875-2883.

A review. Diagrams and illustrations. (E10, Al, Mg)

377-E. Influence of the Equilibrium Diagram on Shrinkage During Solidification. (In French.) André Tatur. *Fonderie,* Apr. 1952, p. 2884-2897.

Relationships between shrinkage during solidification, chemical composition, and period of solidification, as well as factors affecting pipe formation. Experiments conducted on pure Pb, Sn, Zn, Cd, and Bi; and on Pb-Sn, Zn-Cd, and Mg-Zn alloys. Graphs, tables, diagrams, and photographs. 28 ref. (E25, M24)

378-E. Choice of Lining for Cupolas; Mounting and Repairing Techniques. (In French.) *Fonderie,* Apr. 1952, p. 2903-2905. (E10)

379-E. Production From the Technical Point of View. (In French.) *Journal d'Informations techniques des Industrie de la Fonderie,* Jan. 1952, p. 5-8.

Production of oven doors so as to have tightness and good insulation, use of siphon-type brick in cupolas, and the use of talc sprinklers for tap holes in foundry furnaces. Includes schematic drawings. (E10)

380-E. Desulfurization of Pig Iron. (In French.) André Guédras. *Métallurgie et la Construction méchanique,* v. 84, Mar. 1952, p. 221, 223.

Different kinds of special coke used for cupola melting. (E10, CI)

381-E. Crucible Induction Furnaces for Operation on Power-Line Frequencies. (In German.) R. Lethen. *Giesserei,* v. 39, Apr. 3, 1952, p. 145-152.

Development of above furnaces for melting metals. Tables, graphs, diagrams, and photographs. (E10)

382-E. Cement-Bonded Molding Sand. C. D. Galloway. *American Foundryman,* v. 21, May 1952, p. 67-69.

Some of the studies and experiences of a cast iron foundry in making the change from dry sand to cement. (E18, CI)

383-E. Brass Foundry Mechanization. *American Foundryman,* v. 21, May 1952, p. 74-77.

Moccasin Bushing Co., Chattanooga, Tenn., illustrates progressive mechanization of a small bronze foundry. (E general, Cu)

384-E. Making a Separate Oven for Drying Sand-Lined Ladles. C. C. Spencer. *American Foundryman,* v. 21, May 1952, p. 82.

Drying sand linings of pouring ladles formerly required 8-12 hr., thus tying up much-needed core-oven capacity. Building a separate unit for this job has cut the time required to 3-4 hr., and provides an adequate supply of thoroughly dried sand-lined ladles without disrupting production in any department of Electric Steel Castings Co., Indianapolis. (E23)

385-E. Effects of Annealing on the Removal of Burned-On Sand. Donald Alverson. *American Foundryman,* v. 21, May 1952, p. 91-92.

Explanation, in terms of physical rather than chemical changes, is supported by micrographic studies of two cast iron test castings taken from normal production runs.
(E24, J23, CI)

386-E. Redesigned for Gray Iron Casting Production. *American Foundryman,* v. 21, May 1952, p. 94-95.

Contest winners in Gray Iron Founders' Society Redesign Contest: Cast iron crankshaft substituted for forged steel in 8-cylinder diesel engine; cast iron mold-conveyor yoke; and outboard bearing stand for a large engine. (E11, CI)

387-E. Shell Mold Casting Method Invades Automotive Field. James R. Custer. *Automotive Industries,* v. 106, June 1, 1952, p. 42-43.

Production of some parts is already under way and experimental work is being conducted by numerous companies. Automatic shell-making machines demonstrated publicly for first time at foundry exposition. (E16)

388-E. Melting Aluminum-Base Alloys. L. W. Eastwood. *Canadian Metals,* v. 15, May 1952, p. 40, 42-43.

Charging and melting, preparation of remelting ingots and effect of temperature and holding time on Al alloys. (E10, Al)

389-E. Modern Pressure Die Casting Foundry. *Canadian Metals,* v. 15, May 1952, p. 44-45.

Previously abstracted from *Metallurgia;* item 284-E, 1952. (E13)

390-E. The Shell Molding Process. Its Mechanics and Applications. Bernard N. Ames, Seymour B. Donner, and Noah A. Kahn. *Foundry,* v. 80, June 1952, p. 112-117, 287-295.

See abstract of "Metallurgy of Shell Molding", *American Foundryman;* item 128-E, 1952. (E16)

391-E. Casting Brake Drums at the Budd Co. Foundry. John Howe Hall. *Foundry,* v. 80, June 1952, p. 118-122.

New plant in Philadelphia which

produces up to 4000 gray iron castings per 8-hr. shift, yet employs only 50 men. (E11, CI)

392-E. Mechanizing for Increased Production. Erle F. Ross. *Foundry,* v. 80, June 1952, p. 124-127, 253-254.

Adaptable molding system installed in the Al foundry of Waukesha Foundry Co., Waukesha, Wis. (E19, Al)

393-E. Casting the Superalloys. Thomas A. Dickinson. *Foundry,* v. 80, June 1952, p. 255-256.

Brief discussion for some typical superalloys including a metal-ceramic. Table gives some physical, mechanical, and corrosion-resistant properties.
(E general, P general, Q general, R general, SS, SG-h)

394-E. Production of Castings in Aluminium-Bronze, D. T. D. 412. L. Hargreaves. *Foundry Trade Journal,* v. 92, May 8, 1952, p. 487-489.

Experimental development of procedure. (E general, Cu)

395-E. Some Casting Problems of Copper-Lead Alloys. P. D. Liddiard and P. G. Forrester. *Foundry Trade Journal,* v. 92, May 15, 1952, p. 509-515; May 22, 1952, disc., p. 541-545.

Casting of Cu-Pb alloys as linings onto steel shells has many problems, some not common to the casting of solid bodies. Theoretical aspects, such as equilibrium diagram of the system, effect on it of other elements, etc. Problems anticipated, and practical methods being used to produce these linings by casting. Methods used in Great Britain, in the United States and on the Continent are critically reviewed and compared. Static, centrifugal, and continuous processes. 10 ref.
(E general, M24, Cu, Pb, SG-c)

396-E. Synthetic Resins in the John Harper Foundry. J. W. Dews and P. H. Drury. *Foundry Trade Journal,* v. 92, May 22, 1952, p. 535-539, 550.

Experiences in the development of a urea-formaldehyde liquid-resin core binder in preparation for large-scale operation. Tables and photographs. (E18)

397-E. Note on the Deoxidation of Brasses. *Foundry Trade Journal,* v. 92, May 22, 1952, p. 549.

Previously abstracted from *Fonderie,* item 269-E, 1952. (E25, Cu)

398-E. Small Plants Favor Induction Furnaces. Lewis B. Reed. *Iron Age,* v. 169, May 29, 1952, p. 79-81.

Small plants in the Los Angeles area have found electric induction furnaces more suited to their needs than gas furnaces—despite higher melting costs of the former. Lower maintenance costs, silicon dispersion without labor, and better temperature control are cited. Also in favor are the lack of noxious and sulfurous fumes, lowered operator fatigue, and lack of heat, open flames, and fire hazards. Induction furnaces permit high metal recovery. (E10)

399-E. Good Design Can Cut Die Casting Costs. W. M. Halliday. *Iron Age,* v. 169, June 5, 1952, p. 138-141.

See abstract of "Designing Components for Die-Casting", *Foundry Trade Journal,* item 158-E, 1952.
(E13, Sn, Pb, Zn, Al, Mg, Cu)

400-E. Studies of Gases Evolved on Solidification of Molten Cast Iron. III. On the Effect of Humidity. (In English.) Minao Otsuka. *Japan Science Review,* v. 2, Aug. 1951, p. 197-202.

Variation of percentage of foundry scrap between the dry and rainy seasons was studied. Cast irons were melted on days of high and low humidities in an electric furnace and a 1-ton cupola, and the gases evolved on solidification were collected and analyzed. Experiments were made to determine whether H_2 from iron hydroxide penetrates into molten Fe or not. Also moist air of various humidities produced by bubbling or by steam, was blown onto molten iron surfaces, the slag being removed before and during blowing. Evolved gases were analyzed. (E25, CI)

401-E. Some Experiments With Ductile Cast Iron. C. C. Hodgson and C. S. Johnson. *Metallurgia,* v. 45, May 1952, p. 218-224.

An investigation to enable comparison with blackheart malleable cast iron. Production of the iron on a laboratory and plant scale; influence of raw materials on the response to nodulization, and relationship between chemical composition and mechanical properties of annealed ductile cast iron; full-scale foundry tests; and machining tests. Tables, micrographs, and graphs.
(E25, Q general, G17, CI)

402-E. Modern Foundry Practice. T. W. Bushell. *North East Coast Institution of Engineers & Shipbuilders, Transactions,* v. 68, Apr. 1952, p. 277-312.

Recent history; making of the "perfect casting"; a new general foundry department; problems and heat treatment in steel castings production; testing and inspection methods; and tables of chemical composition and mechanical properties. Radiographs and micrographs.
(E general, CI)

403-E. How Intaglio Lettering and Design Are Die Cast Without Retracting Slides or Loose Cores. W. M. Halliday. *Precision Metal Molding,* v. 10, June 1952, p. 28-29, 78-83.

British procedure. Detailed drawings. (E13)

404-E. New Process Reclaims Borings. *Steel,* v. 130, June 2, 1952, p. 97-98.

British development for melting and feeding cast-iron borings or swarf to the cupola. (E10, A8, CI)

405-E. Shell Molding by the Croning Process. Richard Herold. *Tool Engineer,* v. 28, June 1952, p. 53-56.

See abstract of "Sand Castings With Croning Process Shell Molds", *Canadian Metals;* item 316-E, 1952.
(E16, Al, CI, AY)

406-E. Nodular Cast Iron. (In Swedish.) Lars Barrling. *Gjuteriet,* v. 42, Apr. 1952, p. 55-61; disc., p. 61-62.

Experiments at SKF, Katrineholm, on producing nodular cast iron on an industrial scale. Relationship between structure of cast iron and mechanical properties, and different methods of making nodular cast iron. At SKF, nodular cast iron is made by adding approximately 1.5% of a Ni-Mg alloy containing 15% Mg to the melt at 1400-1450° C. The melt is then inoculated with 75% ferrosilicon so that the silicon content is increased by 0.5-0.1%. (E25, CI)

407-E. Effect of Raw Materials on Cupola Operation. Bernard P. Mulcahy. *Foundry,* v. 80, June 1952, p. 284, 286.

Effective sorting of poorly graded scrap and the handling of borings in making up cupola charges. (To be continued.) (E10)

408-E. Electromagnetic Levitation of Solid and Molten Metals. E. C. Okress and D. M. Wroughton. *Journal of Applied Physics,* v. 23, May 1952, p. 545-552.

An unconventional method of heating and melting metals without a crucible, by suspension in space with an electromagnetic field. Operating conditions and material for high-melting point metals thus avoiding difficulties of container preliminary results with various forms and masses of metal. Considerations concerning the atmosphere in which levitation occurs. Graphs, diagrams, and photographs. (E10, EG-d)

409-E. (Book) **Hochwertiges Gusseisen (Grauguss) seine Eigenshaften und die physikalische Metallurgie seiner Herstellung.** (High-Strength Cast Iron (Gray Iron) Its Properties and Physical Metallurgy of Its Production. Ed. 2. Eugen Piwowarsky. 1070 pages. 1951. Springer-Verlag, Berlin, Germany.

The structure, properties, production, testing, and uses of unalloyed and alloyed cast irons. Effects of gaseous and solid elements and of thermal and mechanical treatments on the properties of cast irons. Tables, graphs, diagrams, photographs, micrographs, and numerous references. (E general, CI)

F

PRIMARY MECHANICAL WORKING

143-F. Tubes From Slugs. 125 Extrusions per Minute. Frank Charity. *American Machinist,* v. 96, May 26, 1952, p. 100-101.

Downward extrusion, or "squirting," is employed in a 75-ton press to produce aluminum tubes to close specifications at AiResearch. Impact, heat (900° F.), and pressure cause the metal to squirt through a space between the mandrel and the die walls, thus creating a continuous Al tube. (F26, Al)

144-F. Operations in Extruding Hollow Steel Propeller Blades. *Automotive Industries,* v. 106, May 15, 1952, p. 38-39.

Each of 13 steps is illustrated schematically. Cr-Ni-Mo steel is used. (F24, SS)

145-F. Forging and Heat Treating of Shells Is Speeded by Newest Equipment. Arthur Q. Smith. *Industrial Gas,* v. 30, May 1952, p. 5-7, 23-24.

Two new jet-combustion, gas-fired forging furnaces and a modern conveyor system for heating and handling of billets for hot extrusion and draw forming of 90, 105, and 120-mm. projectiles. Also two new jet-combustion, gas-fired rotary furnaces, one for heat treating and the other for drawing. Equipment is located in the East Chicago, Ind., plant of General American Transportation Corp. (F21, J general, ST)

146-F. Automatic Forging Presses Feature New Shell Line. John A. Verson and Henry Irwin. *Iron Age,* v. 169, May 22, 1952, p. 117-125.

Full automaticity and fast production of closed-die forgings on large mechanical presses are features of press line engineered and built by Verson Allsteel Press Co. No manual labor is needed from the time the billet leaves the furnace until the finished shell drops onto the conveyor belt. Water-cooled die pots and punches are used. Transfer equipment is air-driven and electrically controlled. Diagrams and illustrations. (F22, ST)

147-F. Tight Motor Design Powers Fastest Cold Mill. Bruce D. Mickey. *Iron Age,* v. 169, May 22, 1952, p. 126-129.

Five-stand cold mill being installed at the Fairless Works of U. S. Steel Co. will have a delivery speed of 7000 ft. per min. Successful commutation at high overloads has necessitated use of a 6-unit motor on the 5th stand of this mill. Diagrams and illustrations.
(F23, ST)

148-F. Strip Rolling Adds to Warehouse Service. *Steel,* v. 130, May 19, 1952, p. 100.

Single-stand reversing mills, 4-high, are used to roll strip to customer specifications by Production Steel Coil, Inc., at Detroit, Buffalo, and Chicago. (F23, ST)

149-F. Applications of Electric Upset Forging. Paul Granby. *Steel Processing,* v. 38, May 1952, p. 228-231, 243.

An automatic electric upsetting machine is used to heat the initial round or flat stock and simultaneously upset it into a head which will contain the exact volume of metal required for forming the final shape. Typical applications are production of poppet valves for internal combustion engines and of jet-engine blades. All kinds of ferrous and nonferrous metals can be handled. (F22)

150-F. Straightening Structural Members in Place. Howard L. Harrison. *Welding Journal,* v. 31, May 1952, p. 257s-262s.

Results of research on underlying principles of methods used successfully in straightening damaged bridge members and effects on the metal of these methods. Present straightening techniques, experiments with members under load, and suggested straightening procedures. Results of tension, hardness, and impact tests, and of microstructural examination of straightened mild-steel flat bars. (F29, Q general, CN)

151-F. Application of the Theory of Plasticity to the Shaping of Metals. Rolling of Thin Strips. (In French.) J. Lerebours-Pigeonniere. *Metaux: Corrosion—Industries,* v. 27, Mar. 1952, p. 119-134.

Properties of hot and cold metals, problems caused by contact of machine parts with the metal, and application of theory of plasticity to rolling of thin strips. Diagrams and graphs. 19 ref. (F23, Q23)

152-F. Study of the Surface Defects of Rolled Aluminum Semifinished Products: "Netting". (In French.) J. Hérenguel, M. Scheidecker, and F. Santini. *Revue de Métallurgie,* Apr. 1952, p. 283-292.

"Netting" is a surface defect characterized by a network of grooves (or fine cracks) visible on the surface of rolled Al products, the depth of which is limited to a few thousandths of a millimeter. Causes, means of elimination, and preventive measures. Micrographs and tables. (F23, Al)

153-F. Design and Operation of Modern Soaking Pits and Equipment. (In German.) Oskar J. Stebel. *Stahl und Eisen,* v. 72, Apr. 24, 1952, p. 466-474; disc., p. 474-475.

Describes, diagrams, and illustrates various types. Includes burners, refractory linings, recuperators, fuels used, preheating of air and gas, slagging practice, fuel consumption, etc. (F21)

154-F. Cold-Reduction Plant for Production of Tin-Plate at Trostre, Llanelly. H. Leighton Davies. *Engineering,* v. 173, May 16, 1952, p. 629-632.

See abstract under similar title from *Journal of the Iron and Steel Institute,* item 161-F below. (F23, L16, CN, Sn)

155-F. Temperature Measurements in Wire Drawing With a Wire-Die Thermocouple. W. Lueg. *Engineers' Digest,* v. 13, May 1952, p. 160.

Previously abstracted from original in *Stahl und Eisen.* See item 23-F, 1952. (F28, S16, ST)

156-F. Welded Tubing Produced on Fast, Automatic Lines. Frank Manor. *Iron Age,* v. 169, May 29, 1952, p. 96-97.

Two lines convert SAE 1010 and 1020 steel coil into finished welded tubing, cut to size and ready for forming, at Ford Motor Co.'s Mound Road Plant in Detroit. The tubing is used to make drive shafts and rear-axle tubes. Annealing is included for larger diameter tubing. (F26, CN)

157-F. Big Salt Bath Heats Steel Forging Billets. *Iron Age,* v. 169, June 5, 1952, p. 141.

Equipment at U. S. Air Force Experimental Plant, managed by Bohn Aluminum Corp., Adrian, Mich. (F21, ST)

158-F. Cold Rolling With Strip Tension. Part I. A New Approximate Method of Calculation. *Iron & Steel,* v. 25, May 17, 1952, p. 211-216; disc., p. 251-256.

Computational work. Presents the results graphically, in a form which allows roll force and torque to be calculated rapidly and simply. (F23)

159-F. Cold Strip Rolling; Effect of Tension on Torque and Roll Force. W. C. F. Hessenberg and R. B. Sims. *Iron & Steel,* v. 25, May 17, 1952, p. 217-220; disc., p. 251-256.

The principal experimental results comprise measurements of roll force and torque at reductions of approximately 30 and 50%, on annealed material and on material which had previously been cold rolled to a reduction of about 40%. Results are also included for annealed strip during cold rolling. (F23)

160-F. Hot and Cold Flat Rolling; Pressure Distribution Between Stock and Rolls. C. L. Smith, F. H. Scott, and W. Sylwestrowicz. *Iron & Steel,* v. 25, May 17, 1952, p. 220-224, 233; disc., p. 251-256.

See abstract under similar title from *Journal of the Iron and Steel Institute,* item 131-F, 1952. (F23, Cu)

161-F. Presidential Address; Development of the Tinplate Trade. H. Leighton Davies. *Iron & Steel,* v. 25, May 17, 1952, p. 264-269. (A Condensation.)

See abstract from *Journal of the Iron and Steel Institute,* item 165-F, below. (F23, L16, CN, Sn)

162-F. Phosphate Coatings as Lubricants in the Severe Cold Forming of Metals. Part 1. General Description. S. Spring. **Part 2. Application.** Ludwig K. Schuster. *Iron and Steel Engineer,* v. 29, May 1952, p. 64-71; disc., p. 71.

General description, formation and mechanism of action. Application of these coatings to stamping; wire, tube, and deep drawing; and cold-extrusion operations in the steel industry. Tables. (F1, G21, ST)

163-F. Design and Operation of Electric Weld Pipe Mill at National Tube's National Works. G. C. Anderson. *Iron and Steel Engineer,* v. 29, May 1952, p. 96-101; disc., p. 101.

Mill located at McKeesport, Pa., was built to make large-diameter high-strength pipe for transmission of natural gas under high pressures. Photographs and layout diagram. (F26, CN)

164-F. Measurement of Die Pressures in Wire Drawing By Photo-Elastic Methods. P. M. Cook and J. G. Wistreich. *Journal of Applied Physics,* v. 3, May 1952, p. 159-165.

Pb-Sn alloy strips are drawn through a wedge-shaped die made of stress-optically sensitive plastic. Filon's method of stress analysis was used. The pattern of isoclinics was found to have new features. Photographs, diagrams, and graphs. 10 ref. (F28, Q25)

165-F. The Development of the Tinplate Trade With Particular Reference to the Installation of the Cold-Reduction Plant at Trostre, Llanelly. H. Leighton Davies. *Journal of the Iron and Steel Institute,* v. 171, May 1952, p. 15-37.

History of development of present-day equipment and procedures. Steel sheet rolling, pickling, cleaning, annealing, shearing, and electrolytic and hot-dip tinning. Numerous diagrams and illustrations. (F23, L16, CN, Sn)

166-F. Comparisons Between British and American Rolling-Mill Practices. G. Foster. *Journal of the Iron and Steel Institute,* v. 171, May 1952, p. 87-91; disc., p. 91-96.

From report of British Iron and Steel Productivity Team (F23)

167-F. Developments in Cold-Flow Pressing and Extrusion of Steel. Karl Sieber. *Machinery* (London), v. 80, May 22, 1952, p. 891-897; May 29, 1952, p. 937-941. (Translated from *Draht.*)

Developments in cold forging techniques. Fundamental factors governing the plastic behavior of metal during cold forming. Diagrams and graphs. (F22, F24, ST)

168-F. Wheel Production at Steel, Peech and Tozer. *Metallurgia,* v. 45, May 1952, p. 247-249. **Steel, Peech & Tozer Railway Wheel Mill.** *Machinery* (London), v. 80, May 15, 1952, p. 857-860.

Processes include forging, rolling, and heat treating. (F22, F23, J general, CN)

169-F. Utilising the Hammer: Productivity in the British Drop-Forging Industry. *Metal Treatment and Drop Forging,* v. 19, May 1952, p. 233-236.

A brief survey of developments in the British drop forging industry subsequent to the visit to America in 1949 of the Productivity Team. (F22)

170-F. Extruding Precision Aluminum Tubing. Bartlett West. *Modern Machine Shop,* v. 25, June 1952, p. 122-124, 126, 128, 130, 132, 134-135.

Method of manufacturing tubing used in nearly 75 types of aircraft heat exchangers at AiResearch Mfg. Co., Los Angeles. (F26, Al)

171-F. Fiberglass Sheath the Secret: New Method Makes Stainless Extrusion Practical. *Steel,* v. 130, June 2, 1952, p. 92-96.

New equipment and procedure at Babcock & Wilcox provides the first American extrusion press having the speed and other design features necessary to take full advantage of the French Ugine-Sejournet hot extrusion process. The plant has successfully extruded stainless Types 304, 321, 310, 316, and 446; pure Mo; and pure Ti. Extrusion of a tube from a round-cornered, square, continous-cast billet, wherein a finished tube was produced from molten steel in just three operations. A Fiberglass sock melting on contact with the hot steels prevents seizing of the billet and tools, and insulates the tools from heat. Excellent lubricating properties of the glass reduce friction and make possible increased billet length. (F24, SS, Mo, Ti)

172-F. Hunter Douglas' Continuous Casting Method Converts Molten Aluminum to Strip in a Matter of Minutes. J. L. Hunter and R. A. Quadt. *Western Metals,* v. 10, May 1952, p. 33-35.

See abstract under similar title, *Iron Age;* item 123-F, 1952. (F23, C5, Al)

173-F. Aluminium Cable Making in India. *Wire Industry,* v. 19, May 1952, p. 454-455.

Operations at a specific plant. Al rod and galvanized-steel wire are the raw materials. (F28, Al, ST)

174-F. The Forces and Tensions of the Wire Drawing Process. E. Siebel. *Draht* (Wire) (English Ed.), Dec. 1951, p. 11-15.

Theoretical aspects and practical implications of this knowledge. Graphs. (F28)

175-F. Area Reduction and Distribution of Draws for the Drawing of Iron and Steel Wire. Friedrich Kohlhase. *Draht* (Wire) (English Ed.), Dec. 1951, p. 15-17.

Method of calculations, table of values for use in connection with them, and numerical examples. (F28, Fe, ST)

176-F. Some Well-Known Methods for Checking the Profile of Drawing Die Bores. Gerhard Reitzig. *Draht* (Wire) (English Ed.), Dec. 1951, p. 25-27.

Diagrams and illustrations. (F28, S14)

177-F. Modern Measuring and Inspecting of Carbide Drawing Dies. Günther Jackwirth. *Draht* (Wire) (English Ed.), Dec. 1951, p. 33-34.

Instrument called the "Alfa Meter". Diagram and illustrations. (F28, S14)

178-F. How to Determine the Bore Profile of Carbide Drawing Dies. Karl Schimz. *Draht* (Wire) (English Ed.), Dec. 1951, p. 34-36.

Construction of various apparatus. (F28, S14)

179-F. The Heating of Dies in Metal Tube-Drawing and Extrusion Presses. (In German.) K. Laue and M. Arenz. *Metall,* v. 6, Apr. 1952, p. 188-190.

Reviews older and modern die heating installations on the basis of the literature. Photographs and diagrams. (F26, F24)

180-F. Practical Exploitation of Recuperative Rolling-Mill Furnaces. (In Russian.) P. V. Kobiakov and M. M. Kotrovskii. *Za Ekonomiiu Topliva,* v. 9, Mar. 1952, p. 8-12.

Construction and fuel economy of this type of furnace. Charts and diagrams. (F21)

181-F. Hollow Extruded Forgings Conserve Critical Materials. George W. Motherwell. *American Machinist,* v. 96, June 9, 1952, p. 119-121.

Method and tooling for making a part for an aircraft landing-gear cylinder using SAE 4340 alloy steel. (F24, AY)

182-F. Continuous Tube Forming and Welding. *Welding & Metal Fabrication,* v. 20, June 1952, p. 204-206.

Includes schematic diagram and illustration of equipment built by a British firm. Oxy-acetylene process. (F26, K2, ST)

183-F. (Book) **Der Kraftbedarf beim Fliesspressen Zylindrischer Hohlteile.** (Load Demands in the Extrusion of Cylindrical Hollow Tubes.) Hans-Joachim Kühne. 91 pages. 1951. Wilhelm Knapp, Halle, Germany. 7.20 DM.

In thesis form. Investigates factors influencing load demands on a crank press during the extrusion of a hollow tube from a cylindrical pellet. Experimental research was carried out on a 250-ton Schuler crank press with standard pellet diameter of 35 mm. and press speeds within the range 30-170 mm. per sec. Autographic recordings of punch load during an extrusion and stripping operation were photographed. Effect on the maximum extrusion load of several variables. Materials extruded included pure Al, Al-alloys Pb, Zn, Mg, and electrolytic Cu. A bibliography of German references and patents on cold extrusion up to 1943 is included.
(F24, Al, Pb, Zn, Mg, Cu)

G

SECONDARY MECHANICAL WORKING

277-G. How to Shear to Closer Limits. J. J. Murphy. *American Machinist,* v. 96, May 26, 1952, p. 102-105.

How standard equipment can be applied to get better shearing at lower cost, both at the shears and on subsequent operations. Diagrams and illustrations. (G15)

278-G. Coining Controls Thickness and Location of Shell Flange. *American Machinist,* v. 96, May 26, 1952, p. 106-108.

Production of gyro-coil housing from high-Ni iron alloy sheet. Diagrams and illustrations. (G3, Fe, Ni)

279-G. Sandwich Structures Are Simple. *American Machinist,* v. 96, May 26, 1952, p. 118-119.

Northrup, Boeing, and Lockheed provide some information on manufacture and fabrication of sandwich structures. (G17)

280-G. Correct Curves for Carbide. *American Machinist,* v. 96, May 12, 1952, p. 142.

A combination induction and mechanical bending method successfully used in bending and twisting helical carbide inserts for milling cutters. Photographs.
(G6, J2, C-n, SG-j)

281-G. Jet Engine Parts Made on Huge Presses. *Automotive Industries,* v. 106, May 15, 1952, p. 54.

Operations at Ryan Aeronautical utilizing 600-ton Warco presses to stamp out parts for exhaust cones, transition liners, aft frames, and other jet components. (G3)

282-G. Abrasive Belt Machine Grinds Jet Blade Airfoils. George Elwers. *Iron Age,* v. 169, May 15, 1952, p. 126-128.

Machine is controlled by four cams. One operator can handle several of these machines. (G18)

283-G. Sharpening Carbide Tools by the Electric Spark Method. W. N. Ulitin. *Machinery* (London), v. 80, May 1, 1952, p. 760-764. (Translated and condensed.)

Previously abstracted from *Stanki i Instruments.* See item 39-G, 1951. (G18, SG-j)

284-G. Metallurgical Factors Influencing Machinability. *Machinery* (London), v. 80, May 8, 1952, p. 813-814. (Based on paper by K. J. B. Wolfe and Peter Spear.)

The factors of hardness, microstructure, soft metal additions, and nonmetallic inclusions. Deals with carbon and toolsteel and brass. (G17, CN, TS, Cu)

285-G. Machining Magnesium Alloys. *Magazine of Magnesium,* May 1952, p. 10-15.

Advantages over other commercially used metals include high machine speeds, low power requirements, minimum tool wear, and smooth finish. 30 pages of tabular data and recommended tool design for the machining of Mg. (G17, Mg)

286-G. Trepanning Speeds Boring Holes in Heavy Metal Sections. Fred V. Lucht. *Materials & Methods,* v. 35, May 1952, p. 174, 176, 178, 180.

See abstract of "Carbide Trepanning Accurate Bores in Record Time", *Steel;* item 198-G, 1952. (G17)

287-G. Specialty Die Designs for Stamping and Forming. Part III. The Sol-A-Die Process. Lester F. Spencer. *Steel Processing,* v. 38, May 1952, p. 234-239, 257.

Developed for small-quantity production of irregular shapes of complex design. The process is based on the principle that most of the required deformation can be obtained in a first-stage die with subsequent development primarily by elastic distortion. Used for such metals as stainless steel and aluminum. Diagrams and photographs. (G3, SS, Al)

288-G. Machining of Aluminum and Its Alloys. (In German.) K. Specht. *Aluminium,* v. 28, May 1952, p. 146-150.

Details, not only of tool shapes for a variety of operations, but also of permissible rates. Diagrams and graphs. (G17, Al)

289-G. New Type Hydraulic Press for Forming Aircraft Parts. *Automotive Industries,* v. 106, June 1, 1952, p. 56, 128.

Wheelon direct hydraulic press designed to accomplish the relatively shallow forming which constitutes the bulk of sheet-metal fabrication in airframe manufacture. The working pad is softer than those employed in conventional rubber-pad presses. (G4)

290-G. Method X Electro-Mechanical Machining. Malcolm F. Judkins. *Canadian Metals,* v. 15, May 1952, p. 56-58.

See abstract under similar title. *Tool Engineer,* item 201-G, 1952, (G17, TS, C-n, SG-m)

291-G. Hole Punching in the Sheet Metal Industry. R. Weisbeck. *Canadian Metals,* v. 15, May 1952, p. 66, 68.

Self-contained hole-punching unit incorporates a spring stripper with the blanking die. Units produce varying hole patterns. (G2)

292-G. Hot Forming With Resistance Heat. *Electrical Manufacturing,* v. 49, June 1952, p. 144-145.

Equipment and process developed by Westin Process Co., Elm Grove, Wis., for various hollow parts. Resistance welder transformer supplies high amperage current to the workpiece through die contacts. (G general, ST)

293-G. Instruments for Force and Temperature Measurement in Metal Cutting. H. Opitz and K. Küsters. *Engineers' Digest,* v. 13, May 1952, p. 145-148. (Translated and condensed from *Werkstatt und Betrieb,* v. 85, Feb. 1952, p. 43-47.)

Instruments include tool-force dynamometers used for measuring forces when turning and shaping or planing. Four such instruments were developed, covering a range from 50 to 15,000 kg. A measuring system using strain gages was developed also. Photographs, schematic diagrams, and oscillograms. (G17, S18)

294-G. More About Carbon-Arc Cutting and Gouging. Hubert Chappie. *Industry & Welding,* v. 25, June 1952, p. 70, 73-79.

Additional information supplementing article in Oct. 1951, issue: item 346-G, 1951. (G22)

295-G. Here's How to Flame Cut Pipe on a Production Line Basis. *Industry & Welding,* v. 25, June 1952, p. 88-89.

Procedures at Colonial Iron Works Co., Cleveland. (G22, ST)

296-G. Another Electro-Machining Method Shows Promise. I. Weber. *Iron Age,* v. 169, May 29, 1952, p. 88-90.

Electro-erosive machining method, combining electrolytic and electro-arcing effects being developed at Frankford Arsenal. Hardness has no effect on cutting time. But thinner wheels, more current, and higher wheel speed, all reduce cutting time. Method can be used for cutting or grinding carbides. Machine now being built will be capable of cutting, tool grinding, boring, and chipbreaker grinding. (G17)

297-G. Studies on the Surface Roughness of Metals Finished by Cutting. (In English.) Norio Takenaka. *Japan Science Review,* v. 2, Aug. 1951, p. 147-158.

In order to investigate the effect of the built-up edge on surface roughness in the cutting direction, 0.1% C mild steel and high speed steel were used for test pieces and tool respectively. A round bar, 30 mm. in diam. and 100 mm. long, on the surface of which were grooved square threads of 2-mm. pitch, was placed in a lathe, and the thread

crests cut with tools having single straight edge. Numerous diagrams, surface profiles, and graphs. (G17, S15)

298-G. Influence of Point of Application of Cutting Oil on Tool Life. William E. Lauterbach. *Lubrication Engineering*, v. 8, June 1952, p. 135-136.

Results of experiments on life of a single-point tool in a lathe-turning operation. (G17)

299-G. Compact, Powerful Machine Cuts Cost of Forming Shallow Parts. *Machine and Tool Blue Book*, v. 48, June 1952, p. 147-151.

A new direct-acting, hydraulic, metal-forming machine, one-tenth the size of conventional presses, yet capable of exerting up to three times the pressures currently used to form sheet metal parts used in airplane construction. Use will not be limited solely to the aircraft industry. (G1)

300-G. The Hot Working of Metals. H. K. Barton. *Machinery* (London), v. 80, May 15, 1952, p. 848-852.

Mass production of bolts, capscrews, and similar items. Mechanical features such as die design and sequence of operations. Importance of stressing metal in compression, and special requirements for light-alloy forgings. Diagrams. (G10, F22)

301-G. Unusual Presses and Dies. C. W. Hinman. *Modern Machine Shop*, v. 25, June 1952, p. 176-178, 180, 182, 184.

A percussion-type power press and a cold-extrusion method. Equipment made by Zeh & Hahnemann Co. Includes heavy broaching of rectangular holes and cold extrusion of steel by various companies. (G1, F24, ST)

302-G. Hydroforming: a New Principle in Deep Drawing. *Modern Machine Shop*, v. 25, June 1952, p. 214-218.

Hydroforming is deep drawing by use of a punch working upward into a flexible die member, which acts as a universal die. Applied to wide range of drawing operations on steel, Al, Mg, Cu, brass, plastics, insulating materials, and precious metals. Diagrams and photographs. (G8, ST, Al, Mg, Cu, EG-c)

303-G. Tips on Forming 17 Chromium Stainless. *Steel*, v. 130, June 9, 1952, p. 95.

Recommendations of R. M. Nelson, Armco Steel Corp., for bending and forming this grade. (G6, SS)

304-G. Basic Forming Techniques for the Copper Base Alloys. Part III. Lester F. Spencer. *Tool Engineer*, v. 28, June 1952, p. 61-64.

Cupping, redrawing, coining, stamping, embossing, cold heading, and similar operations. Selection of tools and lubricants. (G general, Cu)

305-G. Forming Tools for Magnesium Alloys. John Starr. *Tool Engineer*, v. 28, June 1952, p. 69-70.

Stamping dies with integral heating elements, developed at Consolidated Vultee Aircraft Corp. Diagrams and illustrations. (G3, Mg)

306-G. Sawing. (In French.) Gaston Laval and Rene Schweyckart. *Revue de l'Aluminium*, v. 29, Feb. 1952 p. 71-78; Mar 1952, p. 111-116; Apr. 1952, p. 153-154.

First part: Band sawing of light alloys. Second and third parts: Use of circular saws. Details of equipment and procedures shown by diagrams and illustrations. (G17, Al)

307-G. Comparative Research on Grinding Power and Economy of Abrasive Grinding Papers. (In German.) G. Pahlitzsch. *Metaloberfläche*, sec. A, v. 6, Apr. 1952, p. A53-A61.

Experimental investigation of different brands of grinding paper and cloth. Ways of increasing their useful life and method of computing grinding costs. Photographs, diagrams, graphs, and tables. (G18, L10)

308-G. Relationship of Rate of Flame Cutting on Shape of the Oxygen Nozzle. (In German.) L. A. Peletier and C. F. Belderbos. *Schweissen und Schneiden*, v. 4, Mar. 1952, p. 79-80.

Includes tabulated and charted test results. (G22, ST)

309-G. Determination of Power and Output of Planers and Machine Tools. (In German.) Otto Kienzle. *Zeitschrift des Vereines Deutscher Ingenieure*, v. 94, Apr. 21, 1952, p. 299-305.

A simple process for indicating the cutting speed, cutting strength, moment of rotation, and capacity of these machines. Problems and solutions for such calculations. Graphs and diagrams. (G17)

310-G. The Negative Lubricating Action of Certain Liquid Media During Deep Drawing of Metals With Thinning of the Walls. (In Russian.) S. Ia. Veiler. *Doklady Akademii Nauk SSSR*, new ser., v. 83, Apr. 11, 1952, p. 709-712.

Drawing tests were made using various lubricants. Liquids such as CCl_4 were found to increase the tangential stresses and to increase the microhardness of the surface of the drawn parts. Data are tabulated and charted. (G4)

311-G. Cutting Forces During Rapid Cutting by Wide Cutters. (In Russian.) A. Ia. Lopata. *Stanki i Instrument*, v. 22, Dec. 1951, p. 23-25.

Dependence of cutting forces on cutting rate was determined for two steels (plain carbon and a Cr ball-bearing steel). Data are tabulated and charted. (G17, CN, AY, SG-c)

312-G. Dynamometer for Measuring Cutting Forces in Order to Determine Lathe Efficiency. (In Russian.) G. A. Levit. *Stanki i Instrument*, v. 22, Dec. 1951, p. 25-27.

Equipment and test results. (G17)

313-G. Circular Stretching. *Aircraft Production*, v. 14, June 1952, p. 198-199.

Use of an expanding segmental die for sizing gas-turbine stiffener rings of stainless steel. (G9, SS)

314-G. How to Reduce "Before and After" Welding Costs. Part I. Selecting Portable Air Grinders. *Industry & Welding*, v. 25, Apr. 1952, p. 48-50, 53. (To be continued.) (G18)

315-G. Stainless Gutters Downspouts Easily Fabricated. *Iron Age*, v. 169, June 12, 1952, p. 126-127.

Fabrication from Type 430 Cr stainless steel. The operations include truing, shaping, seam pinching, rolling, cleaning, and soldering. Illustrated. (G general, K7, L12, SS)

316-G. Sheet-Metal Forming Without Vertical Press Movements. Gilbert C. Close. *Machinery* (American), v. 58, June 1952, p. 176-179.

New Douglas Aircraft process developed by O. A. Wheelon performed on a comparatively light press by use of an inflatable rubber bag. Diagrams and illustrations. (G1)

317-G. Unusual Die Pierces 726 Holes in Spinner Baskets. Joseph F. Howard. *Machinery* (American), v. 58, June 1952, p. 190-191.

Mass production of the automatic-washing-machine spinner basket at City Auto Stamping Co., Toledo, Ohio. (G2)

318-G. Direct Fluid Action Forms Sheet Metal. *Product Engineering*, v. 23, June 1952, p. 139.

See abstract of "Sheet-Metal Forming Without Vertical Press Movements", Gilbert C. Close, *Machinery* (American), item 316-G above. (G1)

319-G. Machining High Temperature Alloys. P. G. DeHuff and D. C. Goldberg. *Screw Machine Engineering*, v. 13, June 1952, p. 42-47.

See abstract of "Jet Alloys Toss Challenge to Machine Tools", *Steel*, item 234-G, 1952. (G17, SG-h)

320-G. Press Tools for the Tin-Box Industry. G. Taylor. *Sheet Metal Industries*, v. 29, June 1952, p. 503-508.

Designs are described and diagrammed. (To be continued.) (G1)

321-G. Tool Life Tests Faster. *Steel*, v. 130, June 16, 1952, p. 146.

Brief report on the use of radioactive-tracer testing methods at Cincinnati Milling Machine Co. (G17, S19)

322-G. (Book) Sheet Metal Work. Robert E. Smith. 76 pages. McKnight & McKnight, Market & Center Sts., Bloomington, Ill. $1.00.

Various kinds of sheet metal and adaptability of each to industrial needs. Instruction on fabricating these metals for their many everyday uses. Pictures and drawings. (G general)

323-G. (Book) Zerspanbarkeit der Metallischen und Nichtmetallischen Werkstoffe. (Machinability of Metallic and Nonmetallic Materials.) Karl Krekeler. 358 pages. 1951. Springer-Verlag, Berlin, Germany. 34.50 DM.

Materials and methods for machining industrial metals and nonmetals, based on both proved experimental data and industrial experience. Major sections are: materials for cutting and machining tools; testing for machinability; cutting and machining methods and tools; machinability of a wide variety of metals and nonmetallic materials; effect of coolants on machinability. (G17)

H

POWDER METALLURGY

75-H. Hot Pressing Applications Increase. *Steel*, v. 130, May 26, 1952, p. 80-82, 84.

The hot pressing of metal powder generally follows one of two procedures, hot forging or hot molding. In the former, normally cold pressed and sintered parts are removed hot from the sintering furnace and subjected to a forging operation, usually in water-cooled steel dies. In the latter procedure, pressing and sintering are performed simultaneously in one operation. Improved technique for production of tungsten carbide pieces in a number of sizes and shapes; other applications of the process. (H14, W, C-n, AY, CN)

76-H. Sintered-Iron Pieces. (In German.) G. F. Hüttig and A. Vidmajer. *Monatshefte für Chemie und verwandte Teile anderer Wissenschaften*, v. 83, No. 2, 1952, p. 365-376.

Factors which affect the density, specific electrical conductivity, hardness, and tensile strength were investigated. Tables and graphs illustrate the effects of fineness of powder, compressive force, and sintering temperature. 14 ref. (H11, Fe)

77-H. Surface Areas of Metals and Metal Compounds: A Rapid Method of Determination. C. Orr, Jr., H. G. Blocker, and Susan L. Craig. *Journal of Metals*, v. 4, June 1952. *Transactions of American Institute of Mining and Metallurgical Engineers*, v. 194, p. 657-660.

Fatty-acid adsorption can be used to determine the surface area of a variety of powdered metals and metal compounds, and offers further confirmation of the correctness of gas-adsorption methods. Presents a

simplified technique for determination of surface area which is suitable for routine work. 22 ref. (H11)

78-H. Problem of Coring Small Holes Solved by Powder Metallurgy. Fred O. Schulz. *Precision Metal Molding,* v. 10, June 1952, p. 25.

Fabrication of shower-head disks from Ni bronze powder.
(H general, Cu)

79-H. Powder Metallurgy. *Mining Journal,* May 1952, p. 101, 103, 105.

Reviews 1951 developments, dealing with such topics as rolling strip from Fe powder; metal-ceramics; alloyed powders; stainless steel; tungsten carbide; and testing and study methods.
(H general, Fe, AY, SS, C-n)

J

HEAT TREATMENT

157-J. Pick the Right Type of Metal for Flame Hardening Meehanite Castings. C. R. Austin. *American Machinist,* v. 96, May 12, 1952, p. 165-169.

Test results involving mechanical properties, flame hardening data, and metallographic examination, to aid in selection of the different types of Meehanite metal. Photographs, micrographs, and graphs. (J2, Q general, M27, CI)

158-J. How to Case Harden Steel by Nitriding. John L. Everhart. *Materials & Methods,* v. 35, May 1952, p. 90-93.

The process, choice of steel, influencing factors, mechanical properties of the product, and applications. 10 ref. (J28, Q general, AY)

159-J. Precipitation Hardening Stainless Steels Show Advantages Over Standard Grades. Gordon T. Bedford. *Materials & Methods,* v. 35, May 1952, p. 99-104.

Properties of Armco 17-7 PH and 17-4 PH steels which can be readily cold or hot worked and welded, and with proper heat treatment, develop strengths equaling those of the carbon and low-alloy steels at room temperature. Miscellaneous physical, mechanical, and fabrication properties. Heat treatment and welding sequence effects. Extensive tabular data. (J27, P general, Q general, SS)

160-J. Heat Treating Boron Steels; Machinability Can Be Improved. J. D. Graham. *Steel,* v. 130, May 12, 1952, p. 94-96.

Heat treatment, hardness, and microstructure as they apply to machinability. Graphs show transformation, hardenability range.
(J general, N8, G17, AY)

161-J. Narrow Strip Mills Employ Single-Stack Annealing Furnace. *Steel,* v. 130, May 12, 1952, p. 98.

Furnace with high-convection gas circulating systems, high heat inputs, alloy inner covers and oil-sealed bases, widely adopted by the narrow strip industry. (J23, ST)

162-J. Practical Aspects of Tool and Die Heat Treatment. Edward J. Pavesic. *Steel Processing,* v. 38, May 1952, p. 240-243.

A discussion to aid the tool engineer. Selection of material, tool design, and heat treating practice.
(J general, TS)

163-J. New Electron Diffraction Studies of the Carburizing of Iron. (In French.) Jean-Jacques Trillat and Shigeo Oketani. *Revue de Métallurgie,* Apr. 1952, p. 262-266; disc., p. 266.

A technique consisting of vacuum deposition of very thin films of Fe on a support of NaCl; the support is dissolved in water and the film of Fe is subjected to carburizing in the presence of Co or a Co+H_2 mixture. The films are examined by electron diffraction, making it possible to study the kinetics of surface reactions which accompany carburization and to identify different phases formed. Diffraction patterns, diagrams, and tables.
(J28, M21, Fe, ST)

164-J. Induction Hardening of Malleable Iron. (In German.) A. Rühenbeck. *Giesserei,* v. 39, Mar. 6, 1952, p. 103-107.

Advantages and characteristics of above. Graphs, tables, macrographs, and micrographs. (J2, CI)

165-J. General Features of Radio-Frequency Heating and Its Industrial Applications. M. G. Favre. *Brown Boveri Review,* v. 38, Nov. 1951, p. 317-319.

Advantages and possible applications of induction heating of metals and dielectric heating of insulating materials. Different factors determining production costs were investigated. (J2)

166-J. Radio-Frequency Heating Equipment. Brown Boveri. **Radio-Frequency Generators for Industrial Applications.** M. G. Favre. **Work-Handling Equipment for Radio-Frequency Heaters.** E. Guyer. *Brown Boveri Review,* v. 38, Nov. 1951, p. 320-330.

Includes circuit diagrams and illustrations. (J2)

167-J. The Radio-Frequency Heating of Metals. Power Required for the Radio-Frequency Heating of Metals. Radio-Frequency Hardening of Steel. A. Leemann. **Soldering, Annealing, Melting, and Sintering With Radio-Frequency Heating Equipment.** G. Küchli. *Brown Boveri Review,* v. 38, Nov. 1951, p. 331-343.

First article contains formulas and diagrams for determining heating energy required for induction heating of metallic parts and for ascertaining loss of heat due to radiation and convection. Second article: Various methods of operation usually employed in r.f. heating. Last article: Application of r.f. power to soldering, annealing, melting, and sintering. (J2, ST)

168-J. Theoretical Aspects of Radio-Frequency Heating. The Principles of Induction Heating. E. Simmen. **Radio-Frequency Case-Hardening—the Problem of Heat Conduction.** A. Leemann. **Fundamental Theory of the Radio-Frequency Heating of Insulating Materials.** E. Simmen. *Brown Boveri Review,* v. 38, Nov. 1951, p. 361-371.

Includes diagrams and graphs. 20 ref. (J2)

169-J. Hardening Tank Tread Links in Quantity in Batch Furnaces. George Brailsford. *Industrial Heating,* v. 19, May 1952, p. 798-800, 802, 804.

Use of a battery of standard batch-type full-muffle gas-fired hardening furnaces and forced convection draw furnaces. Hardening and drawing operations for the links which are made of SAE 1035 and 8640 steel. (J26, CN, AY)

170-J. Boron Steels: Applications and Characteristics. *Machine and Tool Blue Book,* v. 48, June 1952, p. 166-168, 170, 172, 174-176, 178, 180.

Reviews boron steels from the point of view of several commercial users. Hardenability ranges are charted. Tables show new steels developed to conserve Ni and Mo and present SAE steels vs. alternate steels for a series of applications.
(J28, S22, T general, AY)

171-J. Heat Treatment Plant Developments. Recent Installations for Ferrous and Non-Ferrous Metals. *Metallurgia,* v. 45, May 1952, p. 231-245.

Reheating furnaces; annealing furnaces; annealing of malleable castings; hardening and tempering furnaces; gas carburizing equipment; salt baths; and exfoliation of vermiculite. (J general)

172-J. Isothermal - Transformation Tempering. *Metal Treatment and Drop Forging,* v. 19, May 1952, p. 204. (Translated and condensed from article by E. Theis.)

Previously abstracted from *Stahl und Eisen.* See item 64-J, 1952.
(J23, N8, AY)

173-J. Tyce Engineering Speeds Stainless Parts Production by Versatility and Know-How. *Western Metals,* v. 10, May 1952, p. 38.

Heat treating facilities for aircraft parts. (J general, SS)

174-J. Preheat vs. Low and High-Temperature Stress-Relief Treatments. E. Paul DeGarmo. *Welding Journal,* v. 31, May 1952, p. 233s-237s.

Bend-test results on large carbon steel plate specimens designed to give a direct comparison of preheat, low-temperature stress-relief and postwelding heat treatment at 1200° F. Graphs, micrographs, and macrographs. (J1, CN)

175-J. The Influence of Heat Treatment on the Strength Characteristics and the Structure of Steel Wire. J. Billigmann. *Draht* (Wire) (English Ed.), Dec. 1951, p. 28-33.

The most suitable heat treatment conditions for steel wire of low, medium, and high carbon contents to obtain suitable strength properties and favorable structures. Graphs, tables, and micrographs.
(J general, Q23, M27, ST)

176-J. The Bright Annealing of Wire in Vacuum Furnaces Without the Use of Inert Gas. H. Kalpers. *Draht* (Wire) (English Ed.), Dec. 1951, p. 37-38.
(J23)

177-J. Protective Gases for the Heat Treatment of Steels. (In German.) Ernst Kunze. *Stahl und Eisen,* v. 72, May 8, 1952, p. 561-569.

Survey of literature relating to the physical-chemical fundamentals, types, industrial production, and application of protective gases. Use of C-O_2-H_2 diagram for assessing suitability of protective gases for certain steels. Tables, graphs, and diagrams. (J2, ST)

178-J. Equipment for Inductive Surface Hardening. (In German.) K. Kegel. *Zeitschrift des Vereines Deutscher Ingenieure,* v. 94, Apr. 21, 1952, p. 331-338.

A survey, including practical application problems. 14 ref. (J2)

179-J. The Problem of Controlling Heat Treating Furnaces. (In Russian.) L. A. Klein. *Za Ekonomiiu Topliva,* v. 9, Feb. 1952, p. 30-36.

The planning of work per shift and per working stand in relation to fuel consumption and capacity of the furnaces. Data are tabulated and charted. (J general)

180-J. Precision Process for Rail-End Hardening. *Railway Engineering and Maintenance,* v. 48, June 1952, p. 576.

New process now being employed by Colorado Fuel & Iron Corp., Pueblo, Colo., for obtaining uniformity of pattern, location, and hardness. It employs a series of Selas radiant burners under which the rail ends pass on a hydraulic conveyor system. (J26, CN)

K

JOINING

439-K. How to Weld Titanium. A. J. Rosenberg and E. F. Hutchinson. *American Machinist,* v. 96, May 26, 1952, p. 93-97.
Results of extensive tests made at G.E.'s Thomson Laboratory on three welding methods (inert-arc, spot and flash) for three grades of Ti. Tables, micrographs, and macrographs. Mechanical properties of welds.
(K1, K3, Q general, Ti)

440-K. Welding Study: Titanium and Titanium-Alloy Sheet. *American Machinist,* v. 96, May 26, 1952, p. 98-99.
Results include fatigue-strength data obtained by Chance-Vought Aircraft Div., United Aircraft Corp.
(K general, Q7, Ti)

441-K. Test Methods For Weldments. *American Machinist,* v. 96, May 26, 1952, p. 127, 129, 131.
Methods used in automotive industry. Deep-etch tests, guided-bend tests, shear tests for fillet welds, nick-break tests for butt welds, and size and contour measurement of fillet welds. Diagrams. (K9)

442-K. Welding Stars in Aircraft Production. Frederick S. Dever. *American Machinist,* v. 96, May 12, 1952, p. 170-171.
Five special effects in new, electronically controlled Thompson and Federal welders at Ryan Aeronautical Co. Gasoline tanks, Inconel jet-engine combustion chambers, and exhaust systems are welded.
(K3, Ni, SG-h, Al, ST)

443-K. New Machines at Buick Plant Weld Brackets to Axle Housings. S. M. Spice. *Automotive Industries,* v. 106, May 15, 1952, p. 34-36.
Special arc-welding equipment and procedure. (K1, CN)

444-K. Equipment and Design. Charles Owen Brown. *Industrial and Engineering Chemistry,* v. 44, May 1952, p. 91A-92A, 94A.
New developments in welding of light metals. Apologizes for inaccuracies in Nov. 1951 article.
(K general, Al, Mg)

445-K. Welding Heat Exchangers for the Chemical Industry. John W. Mortimer. *Welding Journal,* v. 31, May 1952, p. 387-392.
Different types of heat exchangers and fabrication procedures for their manufacture. Emphasis on welding, but includes choice of alloys for different parts and service conditions, inspection, testing, and finishing. (K general, T29)

446-K. Metal Transfer in Sigma Welding. R. T. Breymeier. *Welding Journal,* v. 31, May 1952, p. 393-399.
Effect of different welding conditions, current, gas mixtures, and rod material was studied by ultra-slow-motion photography. Experimental results with carbon and stainless steel and with aluminum. Effects of current direction and amperage, and gas, on surface appearance of beads. Their effects on rate of consumption of electrode wire and on voltage recorded are charted. Compares results with pure argon and with Linde's sigma grade (oxygen plus argon.)
(K1, SS, CN, Al)

447-K. Effects of Nose Design on Spot Welding Electrodes. E. F. Holt and L. W. Sink. *Welding Journal,* v. 31, May 1952, p. 400-406.
Performance of nine standard designs of spot welding electrodes in terms of weld quality and electrode life. Each design was tested under two sets of closely controlled conditions by making 10,000 spot welds on two thicknesses of half-hard, cold rolled, mild steel. Appearance of welds and of test electrodes. Graphs and tables. (K3, CN)

448-K. Welding Characteristics of Materials for Aircraft Gas Turbines. A. J. Rosenberg. *Welding Journal,* v. 31, May 1952, p. 407-413.
Results of a welding program on high-temperature sheet materials. Those evaluated include austenitic stainless steels, age hardenable high-Ni alloys (Inconels), Haynes Stellite alloys, low-alloy high-tensile steels, and Ti and its alloys. Micrographs and macrographs.
(K general, AY, SS, Ni, Co, SG-h)

449-K. Dilution and Diffusion Aspects of Nonfusion Welding. *Welding Journal,* v. 31, May 1952, p. 413-414.
Discussion by H. Udin of above paper by R. D. Wasserman and J. Quaas (Dec. 1951 issue; item 102-K, 1952). Includes authors' reply. (K8)

450-K. Hints on Radiant Heating. R. G. Harner. *Welding Journal,* v. 31, May 1952, p. 417-418.
Gas welding of small-diameter steel or wrought-iron pipe for radiant-heating systems. (K2, ST, Fe)

451-K. Factors Involved in Welded Shipbuilding. E. W. Ansell. *Welding & Metal Fabrication,* v. 20, June 1952, p. 213-218.
Diagrams and photographs.
(K general, T22, ST)

452-K. Inclined Fixture Spots Diesel A-Frame for Safe and Easy Welding. C. D. Lentz. *Welding Journal,* v. 31, May 1952, p. 420.
(K1, CN)

453-K. Repair Overcomes Replacement Problems. *Welding Journal,* v. 31, May 1952, p. 421.
Submerged-melt welding to repair cracks and holes in cast steel slag pots for openhearth furnaces.
(K1, CI)

454-K. Broken Casting Repaired Economically by Arc Cutting and Brazing. *Welding Journal,* v. 31, May 1952, p. 423.
Illustrates repair job on crawler-tractor part. $1305.36 and 12 days of downtime were saved. (K8, G22, CI)

455-K. Silver-Brazing Jobs. K. R. Shepard. *Welding Journal,* v. 31, May 1952, p. 424-425.
Diagrams show poor and good joint designs. Table shows properties of several silver-brazing alloys. Recommended procedures for Cu tubing, food containers and dairy equipment (Monel or stainless.)
(K8, Cu, SG-f, Ni, SS)

456-K. Nickel-Bronze Gear Repaired by Inert-Gas-Shielded Arc Welding. *Welding Journal,* v. 31, May 1952, p. 425.
(K1, Cu)

457-K. Surface Tension and the Joining of Metals. E. R. Funk and H. Udin. *Welding Journal,* v. 31, May 1952, p. 247s-252s.
Requirements of surface tension for design of brazing alloys, with reference to some industrially significant systems. Schematic diagrams. 17 ref. (K8, SG-f)

458-K. Heat Flow in Welding. A. A. Wells. *Welding Journal,* v. 31, May 1952, p. 263s-267s.
How heat-dissipation calculations can be used for predicting size of weld and how inspection of ripples on finished welds indicates heat input used. Theory and experimental verification for single-pass arc-butt welding of mild-steel plate. Graphs.
(K9, K1, CN)

459-K. Melting Rate of Coated Electrodes. J. ter Berg and A. Larigaldie. *Welding Journal,* v. 31, May 1952, p. 268s-271s.
Factors affecting melting rate. Experimental equipment and results. Tables and graphs. (K1, T5)

460-K. Electric Arc Welding of Mechanical Parts in Automobile Manufacture. (In French.) Adolph Klopfert. *L'Ossature Métallique,* v. 17, Apr. 1952, p. 189-194.
Advantages in mass production, principles of process, and use in suspension crossbars, rear axles, welded tubes, and wheel rims. Schematic diagrams and photographs.
(K1, T21)

461-K. Recent Experiences in the Welding of Steel Structures. (In German.) A. Dörnen. *Schweissen und Schneiden,* v. 4, Apr. 1952, p. 95-99.
Diagrams and photographs show effects of various factors. (K general, T26, CN)

462-K. Welding in Boiler Construction. (In German.) K. H. Speth. *Schweissen und Schneiden,* v. 4, Apr. 1952, p. 101-108.
Different manual and automatic welding methods; increasing the strength of the weld by heat treating; defects and their sources; and methods of avoiding them. Tables, diagrams, photographs, and macrographs. (K1, CN)

463-K. Light Steel Structures—Sheet-Metal Construction. (In German.) W. Fricke. *Schweissen und Schneiden,* v. 4, Apr. 1952, p. 109-112.
Discussion of some important standards is exemplified by description of light-steel framework for prefabricated houses, steep and flat roof designs, steel sheathing, etc. (K general, T26, CN)

464-K. Fatigue-Bending Strength of Girders. (In German.) A. Erker. *Schweissen und Schneiden,* v. 4, Apr. 1952, p. 112-115.
Tests on welded and unwelded rolled girders prove that welding always reduces the fatigue resistance of the steel. In designing steel structures, allowance must be given for the notch effect of weld seams. Diagrams and tables. 10 ref. (K9, Q9, CN)

465-K. Pressure Welding of Metals, Especially of Aluminum. (In German.) Werner Hummitzsch. *Schweisstechnik,* v. 6, Apr. 1952, p. 37-44.
Reviews pressure welding or cold welding on the basis of the literature. Types of weldments; preparation of the surfaces to be welded; time, temperature and pressure required; and mechanical properties of the weldments. Diagrams, graphs, and micrographs. (K5, Al)

466-K. Classification of Electrodes on the Basis of Their Welding Properties. (In German.) G. Westendorp. *Smit Mededelingen,* v. 7, Jan.-Mar. 1952, p. 19-22.
Author's opinion is that existing systems in use in various countries are inadequate to describe adequately all the properties necessary to make a practical choice for a given welding job. A new classification system. (K1, T5)

467-K. Investigation of Welds Between Stainless and Low-Carbon Steel. (In Russian.) N. Iu. Pal'chuk. *Avtogennoe Delo,* v. 22, Dec. 1951, p. 1-4.
Chemical composition, mechanical strength, and corrosion resistance of various combinations of the two materials were investigated. Data are tabulated. (K general, Q23, R general, CN, SS)

468-K. Automatic Welding of Pipelines by Rotary Butt Welding. (In Russian.) V. K. Ivanov. *Avtogennoe Delo,* v. 22, Dec. 1951, p. 4-7.
Method and conditions. Data are tabulated. Diagrams illustrate procedure. (K1, CN)

469-K. Influence of the Composition of Aluminum Alloys on Their Tendency Toward Formation of Cracks During Gas Welding. (In Rus-

sian.) S. V. Avakian and N. F. Lashko. *Avtogennoe Delo*, v. 22, Dec. 1951, p. 7-9.

Metallographic studies and results. (K2, A1)

470-K. Local Induction Preheating During Arc Welding of Sheet Steel. (In Russian.) L. N. Belov. *Avtogennoe Delo*, v. 22, Dec. 1951, p.9-11.

See abstract of condensed English version, *Engineers Digest*, item 311-K, 1952. (K1, CN, AY)

471-K. The Nature of Nonfusion During Spot Welding. (In Russian.) D. S. Balkovets. *Avtogennoe Delo*, v. 22, Dec. 1951, p. 12-13.

A study was made of defective spot welds in various steels and nonferrous alloys. A test for lack of fusion using the electroconductivity of the weld. (K3)

472-K. Electrodes for Building-Up of Dies. (In Russian.) P. S. Turkin. *Avtogennoe Delo*, v. 22, Dec. 1951, p. 13-16.

Conditions and compositions of the coatings required for low-alloy welding rods to be used for building-up drawing dies. Tables and graphs. (K1, L24, T5, AY)

473-K. Effect of Hygroscopic Moisture of the Coating on Certain Properties of Electrodes. (In Russian.) E. D. Lonskii. *Avtogennoe Delo*, v. 22, Dec. 1951, p. 17-19.

A detailed study was made of moisture in various electrode coatings in relation to humidity and other atmospheric conditions. Tables and graphs. (K1, T5)

474-K. Contact Butt Welding of Tubes With Repeated Upsetting. (In Russian.) I. D. Davydenko. *Avtogennoe Delo*, v. 22, Dec. 1951, p. 20.

The butt welding of carbon steel boiler tubes, and techniques for improving the quality of the welds. (K1, CN)

475-K. Measuring and Recording Welding Currents During Contact Welding. (In Russian.) A. A. Batovrin. *Avtogennoe Delo*, v. 22, Dec. 1951, p. 21-23.

The problems and equipment for obtaining the required data. (K1)

476-K. The Use of Non-Synchronous Interrupters for Spot Welding Stainless Steels. (In Russian.) Z. N. Getselev. *Avtogennoe Delo*, v. 22, Dec. 1951, p. 23-24.

(K3, SS)

477-K. New Method of Arc Welding Cast Iron. (In Russian.) K. K. Khrenov and F. S. Vol'fovskaia. *Avtogennoe Delo*, v. 23, Jan. 1952, p. 3-6.

The brazing of cast iron with Cu or Al bronzes. Includes results of bend tests and photomicrographs. (K1, Q5, C1)

478-K. New Method of Automatic Regulation and Control of Flash Welding. (In Russian.) A. S. Gel'man. *Avtogennoe* Delo, v. 23, Jan. 1952, p. 6-10.

A pneumatic control for flash welders which is similar to American air-hydraulic, cam-driven, flash welding machines. (K3)

479-K. Rectification of Current During Argon-Arc Welding. (In Russian.) *Avtogennoe Delo*, v. 23, Jan. 1952, p. 10-14.

The behavior of various metals as electrodes. Experimental data are charted. (K1)

480-K. Flash Welding of Dissimilar Metals. (In Russian.) G. V. Nedzvetskii. *Avtogennoe Delo*, v. 23, Jan. 1952, p. 14-16.

Tests were made by flash welding steel to copper, steel to brass, copper to aluminum, and aluminum to brass. Structures of the welds are illustrated. (K3, ST, Cu, Al)

481-K. The Use of Powdered Steel From Grinding Waste in Welding Electrodes. (In Russian.) V. G. Chernashkin and A. M. Gofner. *Avtogennoe Delo*, v. 23, Jan. 1952, p. 20-24.

Reclamation of steel powder from grinding waste and its use in electrode coatings. Experimental data from tests made with such electrodes are tabulated and charted. (K1, T5, A8)

482-K. Influence of Gas Pressure Welding on the Quality of Welds. (In Russian.) S. M. Skorodzievskii. *Avtogennoe Delo*, v. 23, Jan. 1952, p. 24-26.

Bend tests were made on specimens taken from the top, bottom, and sides of butt-welded steel tubes. Data are charted and illustrated. (K2, Q5, ST)

483-K. Welding With Multi-Electrode "Bundles". (In Russian.) M. G. Golovintsev. *Avtogennoe Delo*, v. 23, Jan. 1952, p. 28-29.

Use of the process in various industries. (K1)

484-K. The Problem of Weldability of Metals. (In Russian.) S. V. Avakian and N. F. Lashko. *Avtogennoe Delo*, v. 23, Jan. 1952, p. 29-32.

The concepts of weldability of metals. Various types of crystal structures of welds. Includes photomicrographs. (K9, M26)

485-K. Distribution of Heat Flow From Welding Flames and Its Influence on the Formation of Cracks During Heating of Thin Sheets of 30 KhGS (Cromansil) Steel. (In Russian.) N. N. Rykalin and M. Kh. Shorshorov. *Avtogennoe Delo*, v. 23, Feb. 1952, p. 3-7.

Results of various directions of flame impingment on this steel. Experimental data are charted and illustrated. (K2, SS)

486-K. Automatic Welding of Brass to Steel. (In Russian.) N. A. Ol'shanskii. *Avtogennoe Delo, v. 23,* Feb. 1952, p. 7-10.

Carbon-arc welding of brass to steel, riveting, and other means of fastening for guides, bearings, and similar articles as a way of saving significant quantities of non-ferrous metals. Techniques and test data. (K general, Cu, ST)

487-K. Argon Arc Welding of Duralumin. (In Russian.) F. E. Tret'iakov. *Avtogennoe Delo*, v. 23, Feb. 1952, p. 10-13.

Use of tungsten electrodes and various filler materials. Tensile, bend, and fatigue test data are tabulated and charted. (K1, Q general, Al)

488-K. Weldability and the Tendency Toward Formation of Cracks During Welding. (In Russian.) Ia. Gintsburg. *Avtogennoe Delo*, v. 23, Feb. 1952, p. 28-29.

A general discussion. (K9)

489-K. Deformation and Stresses During Welding of Hardenable Steels. (In Russian.) V. N. Zemzin. *Avtogennoe Delo*, v. 23, Mar. 1952, p. 5-8.

Tests were made using low-alloy Cr-Ni-Mo and plain carbon steels. Mechanical properties and residual stresses after welding and various heat treatments were determined. Data are charted. (K general, Q25, Q general, AY, CN)

490-K. Influence of Type of Electrode on the Distribution of Residual Stresses in Welded Joints. (In Russian.) P. A. Mel'nikov. *Avtogennoe Delo*, v. 23, Mar. 1952, p. 9-12.

During welding of low and high-alloy steels, the type of electrode was found to have a significant influence on the value and character of the residual stresses. Data are charted and illustrated. (K1, Q25, AY, SS)

491-K. Investigation of Thermal Processes During Spot Welding by Use of Models. (In Russian.) D. S. Balkovets. *Avtogennoe Delo*, v. 23, Mar. 1952, p. 13-16.

X-shaped and V-shaped models were used. Both steel and Al were tested. Data are tabulated and charted. (K3, ST, Al)

492-K. Automatic Welding and Rapid Assembly of Spherical Tanks. (In Russian.) A. S. Fal'kevich and M. B. Gann. *Avtogennoe Delo*, v. 23, Mar. 1952, p. 19-23.

Includes diagrams and illustrations. (K1, ST)

493-K. Electrodes With "BKZ" Coatings. (In Russian.) A. I. Kuzin. *Avtogennoe Delo*, v. 23, Mar. 1952, p. 24.

Composition of above coatings on ferromanganese electrodes are given. Results of mechanical tests of weld metal produced are tabulated. (K1, T5, Fe-n)

494-K. The Development of X-Ray Standards for Shielded Arc Welds in Aluminum. J. J. Hirschfield, D. T. O'Connor, J. J. Pierce, and D. Polansky. *ASTM Bulletin*, May 1952, p. 81-91.

A set of X-ray standards was established on the basis of guided-bend and tensile tests of 300 specimens. A book of film standards was prepared incorporating a summary of the test data. Standards are intended to apply to certain types of shielded-arc welding in 2S and 3S Al plate and particularly to minecase welds. Tables, photographs, and X-radiographs. (K1, Q27, Q5, S13, Al)

495-K. Jet Heat Exchangers Made Lighter. *Aviation Week*, v. 56, June 9, 1952, p. 58, 60-61.

Production of special Al heat exchangers made by Trane Co., La Crosse, Wis. A flux-brazing method is used to bond the core elements. (K8, T27, Al)

496-K. Solder Simplified. *Canadian Metals*, v. 15, May 1952, p. 60, 62.

Main principles to observe in order to secure consistent, high-quality joints. (K7)

497-K. Brazing Metal to Nonmetal. *Electrical Manufacturing*, v. 49, June 1952, p. 280, 282, 284, 286. (Condensed from "Metal to Nonmetallic Brazing", Library of Congress, Photoduplication Service, Publication Board Project, BP-106-109.)

New direct technique requiring no flux and using hydrides and alloys of Ti, Zr, Cb, and Ta. Method found applicable for diamonds, sapphires, carbides, ceramics, refractory oxides, glass, quartz, stainless steel, and Cr-Fe alloys. (K11, SG-f)

498-K. The Step Welding of Steel. T. Noren. *Engineers' Digest*, v. 13, May 1952, p. 156-158. (Translated and condensed from *Stahl und Eisen*, v. 72, Mar. 27, 1952, p. 347-350.)

See abstract of "The Metallurgical Principles of Stage Welding", *Machinery Lloyd* (Overseas Ed.), item 108-K, 1952. (K1, TS)

499-K. Widely Used Arc Welded Designs Give the New Look in Structural Steel. *Industry & Welding*, v. 25, June 1952, p. 33-34, 67.

Design, equipment, and procedures. (K1, CN)

500-K. Redesign Eliminates Castings, Cuts Costs 50%. Ray Zeh. *Industry & Welding*, v. 25, June 1952, p. 36-37.

Reduction in fabrication costs effected, by Game-Time, Inc.'s all welded redesign of "Pull-A-Wav Merry-Go-Round." (K general, CN)

501-K. Low-Hydrogen Electrodes Now Used for Welding Armor Plate. R. J. Thomas. Jr. *Industry & Welding*, v. 25, June 1952, p. 48, 51, 69.

As a result of recent developments, it has been proven that electrodes of low-alloy steel containing 1½-2% Ni, 0.60-1.0% Mo, and 0.10-0.30% V will give stronger and

tougher welds than those containing much higher amounts of critical alloys. (K1, T5, CN, AY)

502-K. Elements of Resistance Welding. A. E. Rylander. *Industry & Welding,* v. 25, June 1952, p. 54-56, 59, 82-83.
Tooling, feeding problems, and applications. Diagrams and tables. (Concluded.) (K3)

503-K. How Preheating and Controlled Cooling Improve Weld Quality. *Industry & Welding,* v. 25, June 1952, p. 62-64, 66.
Various shaped tubular electrical heating elements made by Edwin L. Wiegand Co. Relation between heating and cooling and weld quality. (K general)

504-K. Load Distribution in Riveted and Spot-Welded Joints. D. Williams. *Institution of Mechanical Engineers, Proceedings* (Applied Mechanics Div.), v. 165, W. E. P. 66, 1951, p. 141-147; disc., p. 157-164.
A theoretical examination on the basis of experimentally obtained stress-strain curves for riveted and spot welded joints in shear. Deals with the plastic, as well as the elastic, part of the stress-strain curves. Examples of the relative behavior of the two types of joint in certain simple structural elements. Diagram and graphs. (K3, K13, Q25)

505-K. Design Stresses in Fillet Weld Connexions. F. Koenigsberger. *Institution of Mechanical Engineers, Proceedings,* (Applied Mechanics Div.), v. 165, W. E. P. 66, 1951, p. 148-157; disc., p. 157-164.
Suggests a means of determining the working loads of eccentrically loaded fillet welded joints by working out the stresses in the plastic state prevailing immediately before failure occurs. Experimental results were in close agreement with calculated results. The two differing opinions on the best arrangement of fillet weld connections joining rolled angle sections to gusset plates were also investigated. Graphs, diagrams, and photographs. (K general, Q25)

506-K. On the Relation Between Characteristics of A. C. Welders and Stability of Welding Arc. (In English.) Kohei Ando. *Japan Science Review,* v. 2, Apr. 1951, p. 59-62.
Fundamental principles. 13 ref. (K1)

507-K. General Analysis of Welding Stresses and Their Applications. (In English.) Masaki Watanabe. *Japan Science Review,* v. 2, Aug. 1951, p. 139-146.
Mathematical analysis and graphical interpretations. (K9, Q25)

508-K. Production Times for Manual Arc Welding. M. H. Wiegandt. *Machinery* (London), v. 80, May 22, 1952, p. 904-905.
Tables compiled by taking averages of a large number of observations under actual working conditions in different ships, and over a considerable period of time. (K1)

509-K. Recent Developments in Rubber to Metal Bonding. W. D. Rae. *Rubber Age and Synthetics,* v. 33, May 1952, p. 173-174. (K11)

510-K. Soldering Aluminum. *Sheet Metal Worker,* v. 43, May 1952, p. 46-48.
Methods, problems involved, and recommended procedures. Table lists commercial solders and fluxes, and their manufacturers. (K7, Al)

511-K. Strength of Bolted Assemblies. Part II. John S. Davey. *Tool Engineer,* v. 28, May 1952, p. 41-45; June 1952, p. 58-60.
For rigid and nonrigid (gasketed) joints. Tables and graphs give strength properties. (K13, Q23)

512-K. Welding Lead Linings and Coils. Harold S. Card. *Welding Engineer,* v. 37, June 1952, p. 23-25, 62, 64.
Joint designs for lead linings of steel tanks and coils. Bending methods and joining using oxyhydrogen torch. (K2, G6, Pb)

513-K. Gas-Welded Tubing for Gas Refrigerators. J. A. Ritter. *Welding Engineer,* v. 37, June 1952, p. 30-33. (A condensation.)
Procedures and equipment of Servel, Inc., Evansville, Ind. Devoted almost exclusively to oxy-acetylene welding of steel tubing. (K2, ST)

514-K. Glass Tape Backs up Welds for Jet Ejector. L. R. Constantine. *Welding Engineer,* v. 37, June 1952, p. 36-37.
How to insure sound welds when only one side of the seam can be welded by use of back-up tape of the same analysis as the submerged-arc flux. Metal welded is carbon steel. (K1, CN)

515-K. Ryan Simplifies Fabrication of Giant Wing Tanks Requiring 30,000 Spot Welds. Joerg Litell. *Western Metals,* v. 10, May 1952, p. 41-42.
Welding procedure in production of Al tanks. Four pairs of seam and spot welding machines are used. They have a 60-in. throat depth and can produce more than 200 spot welds per min. Cleaning of the metal. (K3, L12, Al)

516-K. Ravenna Metal Products Uses Rotating Fixtures to Speed Hand Silver Brazing. Howard E. Jackson. *Western Metals,* v. 10, May 1952, p. 46-47.
Technique at plant in Seattle. (K8)

517-K. Thorough Analysis Plus Necessary Tests Makes Production Runs Pay Off at Automatic Welding. Fred M. Burt. *Western Metals,* v. 10, May 1952, p. 49-51.
Examples of job analysis as conducted at Automatic Welding Co., Inc., Los Angeles. Includes welding of SAE 4140 steel forgings, seam welding Al-alloy tubing, and welding fully assembled tractor rails. (K general, A6, AY, CN, Al)

518-K. A New Electric Arc Welding Method: The "Plurial" Process. (In French.) M. Lebrun. *Soudure et Techniques connexes,* v. 6, Mar.-Apr. 1952, p. 55-63.
Process which uses a bundle of electrodes, rather than a single one. Structural details; time of fusion. Advantages as compared to the usual method. Data are tabulated. (K1)

519-K. Recent Progress of Electric Spot Welding of Aluminum Alloys in French Aircraft Construction. (In French.) J. Faguet. *Soudure et Techniques connexes,* v. 6, Mar.-Apr. 1952, p. 69-81.
Previously abstracted from *Transactions of the Institute of Welding.* See item 669-K, 1951. (K3, Al)

520-K. Welded Trusses in Modern Light Steel Construction. (In German.) E. Bahke. *Schweissen und Schneiden,* v. 4, Mar. 1952, p. 67-79.
Choice of suitable type and shape of material, proper design, and welding methods. Tables, graphs, diagrams, and photographs. 14 ref. (K general, T26, CN)

521-K. Computing and Designing of Welded Girder Joints. (In German.) K. H. Effertz. *Schweissen und Schneiden,* v. 4, Mar. 1952, p. 80-83.
Theoretical discussion shows the importance of considering torsional and bending stresses in computing and designing girders welded to vertical walls. Diagrams and tables. (K general, T26, CN)

522-K. Advances in the Field of Welding and Cutting; Status of Welding Technique in the Soviet Union. (Continued.) *Schweissen und Schneiden,* v. 4, Mar. 1952, p. 83-86; Apr. 1952, p. 125-127.
Reviews the literature on Russian welding research. 30 ref. (K general)

523-K. High Steel Buildings in Western Germany. (In German.) H. Fricke. *Schweissen und Schneiden,* v. 4, May 1952, p. 156-164.
Photographs and drawings show structural details of welded steel structures. The recently developed semi-automatic Humboldt-Meller arc-welding process. (K1, T26, CN)

524-K. Tests for Welding Materials. *American Machinist,* v. 96, June 9, 1952, p. 169, 171, 173.
Reference sheet describing following tests for steel, used in the automotive industry: arc-weld pad for chemical analysis; all-weld-metal tension test; hydrogen test for arc-weld deposits; moisture in welding electrode coatings; and usability test for AWS Class E-XX13 electrode. Tables and diagrams. (K, ST)

525-K. Ceramic Backing for Tube Joints. Bela Ronay. *Journal of the American Society of Naval Engineers,* v. 64, May 1952, p. 359-369.
Arc-weld joint design. Root preparation, which includes the backing material, is directly related to development of ceramic backing for tube welds. Schematic diagrams and illustrations. (K1)

526-K. Strength Properties of Welds in 61S-T6 Aluminum Alloy Sheet. Louis Barrett. *Product Engineering,* v. 23, June 1952, p. 148-150.
Tensile strength of butt joints and shear strength of lap joints in Al-alloy sheet obtained with the Aircomatic inert-gas welding process where the filler wire is used for the electrode. (K1, Q23, Al)

527-K. A Survey of Modern Theory on Welding and Weldability. D. Seferian. *Sheet Metal Industries,* v. 29, June 1952, p. 529-532, 540.
Details of calculations for acid and basic slags, as found in welding electrode coatings. Graphs and tables. (To be continued.) (K9, T5)

528-K. The Interpretation of Weld Radiographs. C. Croxson. *Transactions of the Institute of Welding,* v. 15, Feb. 1952, p. 7-12.
Factors to be considered, together with some examples, mainly of welds in steel not exceeding about 1 in. in thickness and made by various electric-arc processes. Radiographs and diagrams. 11 ref. (K1, S13, ST)

529-K. Stress Distribution in Fillet Weld Connections Between Rolled Angle Sections and Gusset Plates. F. Koenigsberger and H. W. Green. *Transactions of the Institute of Welding,* v. 15, Feb. 1952, p. 13-18.
A report of preliminary work to determine whether an advantage is gained by use of particular arrangement of welds. Concludes that, under static loading conditions, no advantage is gained by using particular arrangement and that practical considerations should decide design of the welds. Three-dimensional stress diagrams and graphs. (K9, Q25, ST)

530-K. Production of Mechanized Farm Equipment. *Welding & Metal Fabrication,* v. 20, June 1952, p. 196-202.
Arc and resistance welding equipment and procedures of Massey-Harris Co., Ltd., in Scotland. (K1, K3, T3, CN)

531-K. Fabricating Modern Pressure Vessels. *Welding & Metal Fabrication,* v. 20, June 1952, p. 207-212.
Arc welding practice at G. A. Harvey & Co., London, for carbon, alloy, and stainless steels, also clad steels. Part 2. (K1, ST)

532-K. The "Dot Weld" Process. J. A. Cooper. *Welding & Metal Fabrication,* v. 20, June 1952, p. 218-219.
Introduction of above method in Britain. Photographs and micrographs. (K6)

533-K. M. L. "Queen Elizabeth". *Welding & Metal Fabrication,* v. 20, June 1952, p. 228-229.

Welding in construction of Al alloy superstructure of Thames pleasure vessel. (K general, T22, Al)

534-K. Correlation of Weldability Tests With Structural Joints. Part I. Investigations With Tests of the Restrained Fillet Type. C. L. M. Cottrell. *Welding Research,* v. 6, Feb. 1952, p. 2r-12r.

Effect of rate of cooling on the initiation of hard-zone cracking was studied. Chief material used was a low-alloy Mn-Mo steel. Tables, diagrams, graphs, and photographs. (To be continued.) (K9, AY)

535-K. The Weldability and Weld Strength of Some Magnesium Alloy Sheet Materials. J. G. Ball. *Welding Research,* v. 6, Feb. 1952, p. 13r-26r.

As applied to oxy-acetylene and argon-arc hand welding. Alloying elements were: Al, Zn, Mn, Ca, Ce, and Zr. Tables, diagrams, and micrographs. (K9, Q23, Mg)

536-K. A New Double-Fillet Test for Hot-Cracking. E. G. P. Hinds. *Welding Research,* v. 6, Feb. 1952, p. 27r-28r.

New test is much more severe than the T-test, which it is intended to replace. The material is mild-steel plate. Diagrams and table. (K9, CN)

537-K. (Book) **Modern Arc Welding.** 544 pages. Hobart Trade School, Hobart Square, Troy, Ohio. $3.00.

Practical textbook on the procedure and practice of arc welding for the practicing engineer, welding operator, and designer. The 28 chapters are divided into five sections. Part 1: Basic procedures and development of electric arc welding. Part 2: A self-study course. Part 3: Principles and practical operations of carbon-arc welding. Part 4: Other welding processes. Part 5: Welding terms and definitions. More than 600 photographs, diagrams, and charts. (K1)

538-K. (Book) **The Welding, Brazing, and Soldering of Copper and Its Alloys.** Herts Radlett. 1951. 188 pages. Copper Development Association, Kendals Hall, Radlett, Hertfordshire, England. Free.

Metallurgical and physical properties and main welding methods. Chapters are devoted to welding of Cu, Cu alloys, and bronze, brazing and silver soldering and some notes on Cu as a brazing material for steel. Soft soldering of Cu and its alloys, additional joining and related processes, and the joining of dissimilar metals. Photographs, line drawings, tables, and charts. (K general, Cu)

539-K. (Book) **Welding: Productivity Report.** 74 pages. Aug. 1951. Anglo-American Council on Productivity, 2 Park Ave., New York City.

Report prepared by a team of British specialists which visited the U. S. in 1950 covers mechanical handling, materials for welding, welding processes and equipment, inspection and testing, working conditions, costs and productivity, and welding in a number of specific industries. Recommendations for British industry. (K general)

540-K. (Book) **Voprosy Teorii Kontaktnoi Svarki.** (Problems in the Theory of Contact Welding.) K. A. Kochergin. 103 pages. 1950. Government Scientific-Technical Publishing House for Machine-Industry Literature, Moscow and Leningrad, U.S.S.R.

The basic electrothermal problems of the most frequently used processes of contact welding of steel. Methods for determination of optimum conditions of operation for each method. 22 ref. (K1, ST)

L

CLEANING, COATING AND FINISHING

524-L. How to Electro-Polish Stainless Steel. Samuel Storchheim. *American Machinist,* v. 96, May 12, 1952, p. 140-141.

A resumé of the present theory and practical application of electropolishing written in terms of shop chemistry. (L13, SS)

525-L. Chromium Plated Piston Rings. *Automobile Engineer,* v. 42, May 1952, p. 181-182.

A resumé of experience gained by a British manufacturer in the development of Vacrom rings. Briefly discusses plating technique. (L17, T7, Cr, ST)

526-L. Pennsalt Gives: Key to Savings in Painting Costs. Robert R. Pierce. *Chemical Engineering,* v. 59, May 1952, p. 149-153.

On basis of comprehensive evaluation of general-purpose system in chemical-industrial atmospheres, a 3-coat system that will give enough build per coat for a five-mil minimum total thickness is recommended. 62 paint materials were studied. Data tabulated. (L26)

527-L. A Study of Acid Pickling Solutions for Wrought Iron and Steel With Special Reference to the Use of Inhibitors. E. E. Halls. *Electroplating and Metal Finishing,* v. 5, May 1952, p. 143-150. (L12, Fe, ST)

528-L. The Use of Coated Abrasives in Wet Grinding and Polishing. *Electroplating and Metal Finishing,* v. 5, May 1952, p. 152-155.

Various applications of coated abrasives in grinding and polishing both metals and nonmetals. (L10, G18)

529-L. Sprayed Aluminum Coatings for the Protection of Steel. T. P. Hoar. *Electroplating and Metal Finishing,* v. 5, May 1952, p. 171, 173-174.

Comparison of wire and powder spraying of Al; electrochemical relationships of Al, Zn, and steel; composite Al-Zn coatings; sprayed coatings as basis for paint; and modification of sprayed Al coatings by heat treatment. (L23, Al, ST, Zn)

530-L. The Influence of the Wave Forms of Rectified Alternating Current on the Growth of Galvanic Deposits. M. E. Beckmann and F. Maass-Graefe. *Engineers' Digest,* v. 13, Apr. 1952, p. 115-116. (Translated and condensed.)

Previously abstracted from *Metalloberfläche.* See item 153-L, 1952. (L17, Sn, Cu)

531-L. Hot Spraying Proves Economical for Aircraft Finishing. Gilbert C. Close. *Finish,* v. 9, June 1952, p. 35-36, 79.

System used by El Segundo Div. of Douglas Aircraft Co. (L26)

532-L. The Use of Phosphors in Vitreous Enamels. Harold P. Cahoon. *Finish,* v. 9, June 1952, p. 39-41.

Research on preparation, application, and properties of luminescent enamels. Willemite gave superior results as a luminescent pigment. Base was 24-gage enameling iron. (L27, ST)

533-L. From Pickle Plant to Inspection. J. Eccleston. *Foundry Trade Journal,* v. 92, May 1, 1952, p. 473-475, 482.

Several new ideas and suggestions on sheet and cast iron enameling. Pickling, inspection, cover-coat enameling, titanium, opacification, mottling, and sieving. (L27, Fe, CI)

534-L. Gas-Fired Galvanizing Furnaces. Allen M. Thurston. *Industrial Gas,* v. 30, May 1952, p. 10-13, 26-28.

Design information and galvanizing operation details. Selecting the pot for the molten metal, types of burner applications, and heating up. Tables and diagrams. (L16, Zn, CN)

535-L. New Developments in Porcelain and Ceramic Coatings. Philip O'Keefe. *Materials & Methods,* v. 35, May 1952, p. 87-89.

One-coat enamels, improved enameling stock, and coatings having improved high-temperature, abrasion, and impact properties. (L27)

536-L. The Vacuum Coating of Metal Articles. L. Holland. *Metal Industry,* v. 80, May 2, 1952, p. 351-354.

Some problems of lacquering technique; properties required of lacquer coatings; influence of base article surface finish on quality of evaporated coatings; vacuum-coating properties of several commercial lacquers used as base coatings on metals; and tinting of evaporated Al films by dyeing the lacquer protective coating. (L25, Al)

537-L. Plastic Coatings Aid Refiners in Fight Against Corrosion. F. Lawrence Resen. *Oil and Gas Journal,* v. 51, May 19, 1952, p. 124, 127.

Use for both interior and exterior surfaces of exchangers, valves, and other equipment. (L26)

538-L. Prevention of Corrosion by Metallic Coatings. U. R. Evans, *Research,* v. 5, May 1952, p. 220-225.

See abstract of "The Role of Protective Coats in the Conservation of Metals", "Proceedings of the United Nations Scientific Conference on the Conservation and Utilization of Resources. Vol. II. Mineral Resources," item 518-L. 1952. (L general)

539-L. Accelerated Phosphate Coating; Fits High Speed Finishing Setups. Norman Kuperschmid. *Steel,* v. 130, May 12, 1952, p. 92-93.

Rapid chemical process coats Zn and Cd parts in 30 sec. to 1 min. Ferrous surfaces are treated in 2-5 min. Application is simple. (L14, Cd, Zn, Fe)

540-L. Zinc Dust recovery Collecting System Saves $6000 per Month. *Steel,* v. 130, May 19, 1952, p. 93-94.

System resulted in 50% increase in Zn dust recovery in pipe galvanizing operations at Etna, Pa., plant of Spang-Chalfant Div., National Supply Co., Equipment diagram. (L16, A8, Zn)

541-L. Production Rebuilding of Tractor Rolls by Submerged-Arc Welding. *Welding Journal,* v. 31, May 1952, p. 416.

With aid of a special work positioner and a Unionmelt welding machine, Alloy Hard-Facing Co., Minneapolis, is able to rebuild worn-out tractor rolls in a fraction of the time usually required. (L24, ST)

542-L. Aluminum Electrodeposited at Room Temperature. *Steel,* v. 130, June 9, 1952, p. 94-95.

Metal coats with good physical properties are produced by a new type organic plating bath developed at National Bureau of Standards. Methods for depositing Mo, W, Ti, and Zr were also studied. (L17, Al, Mo, W, Ti, Zr)

543-L. Radioisotope Study of Porcelain-Enamel Adherence. *Technical News Bulletin* (National Bureau of Standards), v. 36, May 1952, p.74-76.

See abstract of "A Radioisotope Study of Cobalt in Porcelain Enamel", William N. Harrison, Joseph C. Richmond, Joseph W. Pitts, and Stanley G. Benner, *Journal of the American Ceramic Society;* item 501-L. 1952. (L27, Fe)

544-L. Electroplating Process With a Leveling Effect. (In Dutch.) A. Dias Santilhano. *Metalen,* v. 7, Mar. 28, 1952, p. 99-106.

Significance and possibilities of leveling baths in contrast to bright baths. Various technical and chemical aspects, and savings effected by this process. Micrographs, tables, schematic diagrams. (L17)

545-L. Utilization of a Filament of Tungsten as a Support for the Silver Coating of Surfaces by Evaporation in a Vacuum. (In French.) Jean Roig and Emilienne Collet. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences,* v. 234, Apr. 21, 1952, p. 1677-1680.

Good adherence of globules of melted Ag to W was obtained after subjecting the latter to an electrolytic treatment. Compares results with those using a Ta support. (L25, Ag, W, Ta)

546-L. Cleaning of Stainless Steel. (In French.) J. Bary. *Métallurgie et la Construction mécanique,* v. 84, Mar. 1952, p. 259, 261.

HF and $Fe_2(SO_4)_3$ cleaning baths for stainless steel and their advantages. Includes chart. (L12, SS)

547-L. Influence of Cathode Material on the Electrodeposition of Metals. (In French.) R. Piontelli and C. Guerci. "International Committee on Electrochemical Thermodynamics and Kinetics; Proceedings of the 2nd Meeting" (Libreria Editrice Politecnica Cesare Taburini, Milan, Italy), 1951, p. 149-158; disc., p. 159.

Energetic and kinetic aspects of the influence of the nature, conditions of preparation, and surface state of the cathode material in the deposition of metals. Micrographs. 18 ref. (L17)

548-L. The Dynamic Behavior of a Cell for Electropolishing of Copper. (In French.) L. Meunier. "International Committee on Electrochemical Thermodynamics and Kinetics; Proceedings of the 2nd Meeting" (Libreria Editrice Politecnica Cesare Taburini, Milan, Italy), 1951, p. 242-252.

Use of aqueous solutions of orthophosphoric acid. Transitory phenomena at the beginning of the process; anodic oscillations; and short circuiting after polishing. Includes graphs. 12 ref. (L13, Cu)

549-L. Application of Cathodic Current to Metal Surfaces as an Indicator of the Oxide Coating, the Hydrogen Charge, and the Concentration of Dissolved Oxygen. (In German.) F. Tödt. "International Committee on Electrochemical Thermodynamics and Kinetics; Proceedings of the 2nd Meeting" (Libreria Editrice Politecnica Cesare Taburini, Milan, Italy), 1951, p. 232-239.

Experiments using a Pt cathode connected to a nonpolarized anode. Tables and graphs. 10 ref. (L21)

550-L. Ceramics for Jet Use Put Into Production. *Aviation Week,* v. 56, June 9, 1952, p. 30, 32, 35, 37.

Some operations at the Bettinger Corp., Waltham, Mass., devoted to production of high-temperature ceramic coatings of metal. (L27)

551-L. Materials for Tailor-Made Coatings. B. G. Brand. *Battelle Technical Review,* v. 1, May 1952, p. 48-51.

The ingredients of organic coatings—their properties, effects, and applications: pigments, extenders, vehicles, solvents, and additives. Development of improved inner coating for steel drums for Steel Shipping Container Institute at Battelle. (L26, CN)

552-L. Spraying Today in Porcelain Enamel Plants. M. L. Pouilly. *Better Enameling,* v. 23, May 1952, p. 6-8, 29.

General discussion of current shop practice with emphasis on advan-

tages of low-pressure spraying. (L27)

553-L. New Enameling Facilities for the Industrial South. *Better Enameling,* v. 23, May 1952, p. 9-15.
The new 87,000-sq. ft. enameling plant of Athens Stove Works, Inc., Athens, Tenn. (L27)

554-L. Radioisotope Study of Porcelain Enamel Adherence. W. N. Harrison and J. C. Richmond. *Better Enameling,* v. 23, May 1952, p. 16-17.
See abstract of "A Radioisotope Study of Cobalt in Porcelain Enamel", William N. Harrison, Joseph C. Richmond, Joseph W. Pitts, and Stanley G. Benner. *Journal of the American Ceramic Society;* item 501-L, 1952. (L27, Fe)

555-L. Automatic Submerged Arc Welding Speeds Critical Repairs. *Canadian Metals,* v. 15, May 1952, p. 48, 50.
Technique which applies a hard-alloy surface to crawler tractor rollers and idlers. (L24, ST)

556-L. Late Developments in Electrodeposition Techniques. William Blum. *Canadian Metals,* v. 15, May 1952, p. 52, 54.
Chromium plating, testing plated coatings, and plating from non-aqueous solutions. (L17)

557-L. Source of Defect-Producing Hydrogen in Porcelain-Enameled Steel. *Ceramic Age,* v. 59, May 1952, p. 44-45.
See abstract of paper of similar title by Dwight G. Moore, Mary A. Mason, and William N. Harrison, *Journal of the American Ceramic Society,* item 168-L, 1952. (L27, ST)

558-L. Uses Radioisotope to Examine Adherence of Porcelain Enamels. *Ceramic Industry,* v. 58, June 1952, p. 72-73.
See abstract of "A Radioisotope Study of Cobalt in Porcelain Enamel", William N. Harrison, Joseph C. Richmond, Joseph W. Pitts, and Stanley G. Benner, *Journal of the American Ceramic Society;* item 501-L, 1952. (L27, Fe)

559-L. How Chambers Enamels Ranges in 7 Colors. *Ceramic Industry,* v. 58, June 1952, p. 79, 81.
Procedure at Chambers Corp., Shelbyville, Ind. Zr enamels are applied in two coats. (L27, CN)

560-L. What to Do About Filter Press Plates. *Ceramic Industry,* v. 58, June 1952, p. 107.
Various possible coatings for protection of iron plates. Paint; enameling; and Zn, Cu, and Cd coating. (L general, Fe, Zn, Cu, Cd)

561-L. Small Parts Finishing System. Ralph Marson. *Industrial Finishing,* v. 28, May 1952, p. 24-27.
George R. Carter Co.'s plant, Detroit, Mich. Includes loading parts on conveyor, washing, phosphatizing, rinsing, dry-off, spray painting, and oven drying. (L26)

562-L. Hammer Finish for New Power Lawn Mowers. Samuel Standerfer. *Industrial Finishing,* v. 28, May 1952, p. 30-32.
Application of gray and green paint finish at Allied Sheet Metal & Roofing Co., Houston, Tex. (L26)

563-L. Painting the Hay Baler. Walter Rudolph. *Industrial Finishing,* v. 28, May 1952, p. 39-40, 42. (L26)

564-L. Fluorescent Lighting Fixtures. L. J. Rozier. *Industrial Finishing,* v. 28, May 1952, p. 56-58, 60.
Power washer, phosphating treatment, rinse, dry-off oven; spray painting a heated white enamel, and baking the enamel at 310° F. for 17 min. (L26)

565-L. Finishing of Harley-Davidson Motorcycles. *Industrial Heating,* v. 19, May 1952, p. 885-886, 888, 890.
Three paint finishing systems used at above company, with chief emphasis on the ovens involved. (L26, ST)

566-L. How Metal Spraying Speeds Production. *Industry & Welding,* v. 25, June 1952, p. 39-40, 67-69.
Spray metallizing of grinding-wheel spindles for increased life of wearing surfaces. (L23, ST)

567-L. Zinc Protects Trailer Parts From Corrosion. W. G. Patton. *Iron Age,* v. 169, May 29, 1952, p. 82-84.
A zinc protective coating, Zincilate 300, has been used extensively by Fruehauf Trailer Co., to protect steel parts from corrosion. This company has found the protective coating more expensive than prime paint but less costly than hard-to-get Cd. It gives good coverage and may be quickly applied by brush, spray, or dip. (L14, Zn)

568-L. Differential Thickness Coating on Electrolytic Tinplate. S. S. Johnston. *Iron and Steel Engineer,* v. 29, May 1952, p. 72-75; disc., p. 75.
Economic aspects of Weirton Steel Co.'s process for independently plating each side of sheet material. Marking system for identification of the respective sides. (L17, Sn, ST)

569-L. Throwing Power and Covering Power in Electroplating Solutions. W. de Bruijn. *Journal of the Electrodepositors' Technical Society,* v. 27, 1951, p. 1-9; disc., p. 9-11. (Preprint).
Fundamental principles and practical conclusions. (L17)

570-L. Recent Developments in Tin and Tin Alloy Plating. J. W. Cuthbertson. *Journal of the Electrodepositors' Technical Society,* v. 27, 1951, p. 13-20; disc., p. 21-22. (Preprint.) (L17, Sn)

571-L. Power Brushing Solves Many Production Problems. R. R. Schultz. *Machine and Tool Blue Book,* v. 48, June 1952, p. 186-188, 190, 192-193.
Equipment, procedures and applications. (L10)

572-L. Chromium Plating Baths Containing Fluorides or Fluosilicates. T. A. Hood. *Metal Finishing,* v. 50, June 1952, p. 103-106, 112.
Advantages over conventional H_2SO_4 bath, the most important being faster plating speed. Also advantages. 20 ref. (L17, Cr)

573-L. Some Notes on Hard-Coating Aluminum. Herbert E. Horn. *Metal Finishing,* v. 50, June 1952, p. 110-112.
Application of a hard oxide coating. Hardness of the coating; lack of warping during process; resistance to corrosion; heat resistance; operation of the process; alloys for coating; and applications. 20 ref. (L14, Al)

574-L. Radiometric Study of Phosphating Problems. Stanley L. Eisler and Paul G. Chamberlain. *Metal Finishing,* v. 50, June 1952, p. 113-116.
A number of problems pertaining to phosphating of steel were investigated. Results indicated that Fe from the solution becomes an integral part of the phosphate coating; residual phosphate is present on work after grit or sand-blasting; and rephosphating after grit or sand-blasting results in a lower process efficiency than after chemical removal of the original coating. Tables. (L14, ST)

575-L. Fabricated Plastics in the Plating Industry. Raymond B. Seymour and Earl A. Erich. *Metal Finishing,* v. 50, June 1952, p. 117-119.
Uses and techniques of application of fabricated plastic linings to various metal objects, such as tanks, pipe, hoods, ducts, and ventilating equipment. Welding of plastics. Tables give physical and chemical properties of ten common plastic materials. (L26)

576-L. Calculating Chromium Plating Speeds. *Metal Finishing,* v. 50, June 1952, p. 129.
Chart giving average plating speeds for bath containing 400 gm. per 1. of chromic acid, and a chromic acid-sulfate ratio of 100:1 at various current densities and temperatures. (L17, Cr)

577-L. Pickling, Phosphating and Priming of Structural Steel. *Metallurgia,* v. 45, May 1952, p. 253-254.
Anti-corrosion treatment at Appleby-Frodingham Steel Co. The Footner process is used. (L12, L14, CN)

578-L. Methods for Testing for Enamel Coating Discontinuities. Stanley C. Orr. *Non-Destructive Testing,* v. 10, Apr. 1952, p. 23-27.
Previously abstracted from *Better Enameling,* item 82-L, 1952. (L27, S13)

579-L. Wax Type Protective Coatings for Industry. S. O. Greenlee and F. C. Kraatz. *Paint, Oil & Chemical Review,* v. 115, June 5, 1952, p. 16-18, 20, 44-45, 48.
Formulated wax systems, their properties and uses. Varied applications as metal coatings include metal sparkplug shells; miscellaneous corrosion-prevention uses; impact extrusion of Al collapsible tubes; and deep drawing operations. (L26, G4, G5, Al)

580-L. Finishing Methods for Precision Metal Moldings. *Precision Metal Molding,* v. 10, June 1952, p. 45-56, 68-74.
Miscellaneous finishing methods for die castings; investment castings; permanent-mold castings; plaster-mold castings; and powder-metal parts. (L general)

581-L. Influence of Electrical Field on the Formation of Thin Films. (In French.) Marcel Perrot and Jean-Pierre David. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences,* v. 234, Apr. 28, 1952, p. 1753-1755.
Effects of electrical field on vacuum deposition of thin films of Ag and Al were studied. Variations in resistivity of the films with applied field during the deposition process. Data are charted. (L25, Ag, Al)

582-L. The Thermal Formation of Thin Films of Gold and A. Fery's Transformation Points. (In French.) Antoine Colombani and Gaston Ranc. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences,* v. 234, Apr. 28, 1952, p. 1757-1759.
André Féry showed that, upon heating a thin film of Pt black obtained by cathodic sputtering in dry air during deposition of the Pt film, a discontinuous transformation with seven "breaks" at different temperatures takes place, shown by variation in electrical resistivity of the deposits. A similar investigation was made for Au, using vacuum deposition on a silica base. Films between 2000 and 10,000 Å. in thickness were studied. Apparatus and results. (L25, Au)

583-L. Continuous Pickling Plant for Strips and Plate. (In German.) P. Müller. *Metall,* v. 6, Apr. 1952, p. 182-187.
Equipment and procedures used by various German companies. (L12, ST)

584-L. Studies on Electrolytic Polishing. (In German.) Sakae Tajima. *Metalloberfläche,* sec. B, v. 4, Apr. 1952, p. B54-B58; May 1952, p. B73-B75.
See abstract in English, *Japan Science Review,* item 624-L, 1951. (L13)

585-L. Flame Spraying Nonmetallic Coatings Onto Metal Surfaces. (In German.) Hans Reininger. *Metalloberfläche,* sec. A, v. 6, May 1952, p. A71-A76.

Method and equipment. Importance of proper surface preparation and application for good adhesion and prevention of porosity. Photographs and tables. 25 ref. (L26)

586-L. Formation of Coating Films and of Protective Layers. (In German.) Ludwig Werner Haase. *Werkstoffe und Korrosion,* v. 3, May-June 1952, p. 198-205.
The concepts of coating films and protective layers are defined. Various types and their chemical and electrochemical effects. Practical examples show factors influencing the formation of films. (L14, R10)

587-L. Some Aspects of Anodising. K. H. Belcher. *Austaralasian Engineer,* Mar. 7, 1952, p. 66-71.
Mechanism; composition and structure; classification; factors affecting production; comparison of main processes; and effect of alloy constituents. Diagrams and tables. 27 ref. (L19, Al)

588-L. The Surface Treatment of Magnesium. D. R. Hendry. *Australasian Engineer,* Mar. 7, 1952, p. 72-75.
Chemical protective pretreatment; electroplating; painting. Includes table listing chemical treatments by class, their compositions, application methods, etc.
(L14, L17, L26, Mg)

589-L. Gasoline Resistant Tank Coatings. W. W. Cranmer. *Corrosion* (Technical Section), v. 8, June 1952, p. 195-204.
The paint problem; also coating underground, concrete, gasoline-storage tanks. Surface preparation, ventilation, safety precautions and costs. Methods other than coatings were investigated. (L26, R8, ST)

590-L. Interconnection of Pipe Lines Having Various Coatings. David Hendrickson. *Corrosion* (Technical Section), v. 8, June 1952, p. 212-216.
Design of concrete-coated steel aqueducts interconnected with aqueducts with bituminous coating. Galvanic current generated by interconnecting the two aqueducts with different coatings is shown in a specific case. Proper method for isolating these aqueducts is discussed; also results of trying to isolate the two pipe lines by installing insulating joints within a network of interconnecting pipes. Recommended precautions in technique. (L, R, ST)

591-L. Complex Parts Easily Coated With Aluminum. W. G. Patton. *Iron Age,* v. 169, June 12, 1952, p. 115-118.
New method developed by General Motors for imparting corrosion and heat resistance to fabricated steel parts by dipping them in an Al bath. (L16, Al, ST)

592-L. A Hydride Bath for the Electrodeposition of Aluminum. Dwight E. Couch and Abner Brenner. *Journal of the Electrochemical Society,* v. 99, June 1952, p. 234-244.
Process developed for deposition of Al from an ethereal solution of $AlCl_3$ and a metal hydride. An investigation was made of the effect of various inorganic addition-agents on the type of deposit produced from the fused $AlBr_3$-KBr bath. 32 ref. (L17, Al)

593-L. The Mechanism of the Tungsten Alloy Plating Process. Walter E. Clark and M. H. Lietzke. *Journal of the Electrochemical Society,* v. 99, June 1952, p. 245-249.
The mechanism postulated for the plating of tungsten alloys includes: deposition of a film of partly reduced tungstate on the cathode and catalytic reduction of this film by H_2 in the presence of freshly deposited Fe, Co, or Ni. 27 ref.
(L17, W)

594-L. The Electrolytic Polishing of Lead-Tin Alloys for Microscopic Examination. A. W. Moulen. *Journal of the Electrochemical Society,* v. 99, June 1952, p. 133C-36C.
Technique for the electrolytic polishing of Pb, Sn and their alloys, which produces polished and etched specimens without laborious initial grinding and surface preparation, at the same time avoiding the handling of potentially explosive chemicals. Photomicrographs. (L13, Pb, Sn)

595-L. Chemical and Anodic Treatments. (Continued.) V. F. Henley. *Light Metals,* v. 15, May 1952, p. 147-148.
A British patent review covering those published since 1946. Appraises their potential or known usefulness. (To be continued.)
(L14, L19, Al)

596-L. Organic Coatings for Metallizing. Robert B. Stanton. *Organic Finishing,* v. 13, May 1952, p. 18-19.
Consists of using clear lacquer or a similar resinous medium, in which metal powders are dispersed as pigments, to coat a metallic or nonmetallic surface. (L26)

597-L. New Pipe Coating Process. Frank H. Love. *Petroleum Engineer,* v. 24, June 1952, p. D7-D8.
The impact application of H. C. Price Co.'s Hevicote, a heavy concrete-type coating, to line pipe to give it negative buoyancy and protection from corrosion. (L27, CN)

598-L. Application of Hot Applied Coal Tar Coatings for Pipe Lines. N. T. Shideler. *Pipe Line News,* June 1952, p. 38-41.
(L26, ST)

599-L. Some Characteristics of Zinc Cyanide Plating Solutions. III. Limiting Anode Current Density and Solution Resistivity. Gustaf Soderberg. *Plating,* v. 39, Apr. 1952, p. 377-379.
Three-dimensional graphs show limiting anode current densities in Zn solutions, and resistivity of Zn solutions at 77° F. (To be concluded.) (L17, Zn)

600-L. Clear Protective Coatings for Copper-Chromium Plate. Wayne R. Fuller. *Plating,* v. 39, June 1952, p. 616-618, 622.
Screening tests for various types of resins. Processing factors, stripping, coating repair, and coatings on Zn. (L26, Cr, Zn)

601-L. The Preparation of Tinplate for Painting. S. C. Britton. *Sheet Metal Industries,* v. 29, June 1952, p. 545-548, 558.
Experimental evaluation of various methods. Results of scratch tests on painted surfaces following different pretreatments are tabulated and illustrated. (L26, Sn, ST)

602-L. Process Control in Vitreous Enamelling. H. W. Clewes. *Sheet Metal Industries,* v. 29, June 1952, p. 549-556.
Recommended test procedures applied to various steps and materials.
(L27)

603-L. Metal Spraying Technique as Applied to Protection. W. E. Ballard. *Transactions of the Institute of Welding,* v. 15, Feb. 1952, p. 19-22.
Technique using the wire process. Steel, Al, and Zn are mentioned. Micrograph, photographs, and cross-section deposit diagrams.
(L23, ST, Al, Zn)

604-L. The Use of Metal Spraying for the Protection of Structural Steelwork. V. E. Stanbridge. *Transactions of the Institute of Welding,* v. 15, Feb. 1952, p. 23-25, 30.
Factors affecting choice of metal spraying vs. other anticorrosive treatments. Preparatory cleaning methods, and joining methods in relation to metal spraying. The metal sprayed was Al. Tables and photographs. (L23, CN, Al)

605-L. Metal Spraying as a Building-Up Process. A Brief Survey of Techniques, Characteristics and Applications. J. Barrington Stiles. *Transactions of the Institute of Welding,* v. 15, Feb. 1952, p. 26-30.
The manner and adequacy of the bond; cohesion of particles forming the coating; and when to use the method. Photographs, micrographs, and diagrams. (L23)

606-L. Salvage of Worn Machinery by Metal Spray. G. A. Onion. *Transactions of the Institute of Welding,* v. 15, Feb. 1952, p. 31-32.
Surface preparation; nature of wear and metal to be used; corrosive conditions; and economics.
(L23)

607-L. Coating Metal Used in Hot-Dip Galvanizing. Part II. Wallace G. Imhoff. *Wire and Wire Products,* v. 27, May 1952, p. 469-472.
Impurities generally found in Zn slab—Fe, Pb, and Cd, their beneficial and detrimental effects, and possible methods of elimination. (To be continued.) (L16, Zn, ST)

608-L. Hints for Bronze-Surfacing. W. O. Whitehead. *Welding Journal,* v. 31, May 1952, p. 419.
Recommended procedures for repair of worn parts. (L24)

609-L. A New Coating Process for Carbon Wire. Harold Trembicki. *Wire and Wire Products,* v. 27, May 1952, p. 473-475.
The Tioxicoat process forms a titanium oxide with exceptional spreading or flowing properties. All scale is removed in the patenting furnace, thereby eliminating the pickling and cleaning operation entirely. (L16, F28, ST)

610-L. (Book) Chemical and Electroplated Finishes—the Protective Treatment of Metals. Ed. 2. H. Silman. 479 pages. 1952. Chapman and Hall, Ltd., 37 Essex St., London. 50s. net.
Modern industrial finishing processes, together with chemical and physical principles involved. This edition contains some revision together with substantial additions. The opening chapter gives a brief account of principles of corrosion. Remainder of the book deals with industrial processes, giving a brief scientific explanation, the processes proper, plant requirements, process control, and testing. New material on blasting, descaling, polishing methods and compositions, emulsion cleaning, chemical finishes and coloring, plating machines, electrodeposition, testing methods, etc.
(L general, R1)

M

METALLOGRAPHY, CONSTITUTION AND PRIMARY STRUCTURES

226-M. The Structure of Films of Copper Obtained by Electrodeposition on a Monocrystal of Electropolished β-Brass. (In French.) Noboru Takahashi. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences,* v. 234, Apr. 16, 1952, p. 1619-1621.
Includes electron micrographs.
(M27, L17, Cu)

227-M. The Electron Microscope and Metallography. Part II. Applications to Metallography. (In French.) A. Septier and M. Gauzit. *Métallurgie et la Construction méchanique,* v. 84, Mar. 1952, p. 241, 243, 245, 247, 249.
Use of emission, reflection, and transmission microscopes for study of surface finishes, corrosion phenomena, structural aging, and mechanical treatment and heat treatment of steels. Micrographs. (M21)

228-M. The Palladium-Mercury System. (In German.) H. Bittner and H. Nowotny. *Monatshefte für Chemie und verwandte Teile anderer Wissenschaften,* v. 83, No. 2, 1952, p. 287-289.

Preparation and properties of several Pd amalgams (11.2-34.8% Pd). Includes tabulated results of X-ray diffraction studies. (M24, Pd, Hg)

229-M. Structural Neutronography. (In Russian.) R. P. Ozerov. *Uspekhi Fizicheskikh Nauk,* v. 45, Dec. 1951, p. 481-552.

A review of the use of neutrons instead of X-rays or electron beams for the study of the structure of matter. 76 ref. (M22)

230-M. How Can We Obtain Good Micropictures by High Scattering? Some Optical Points of View. (In Swedish.) Sten Modin and L. E. Eriksson. *Jernkontorets Annaler,* v. 136, No. 1, 1952, p. 1-8.

Five different lenses of high resolving power were investigated with respect to their performance in obtaining micrographs of metallic surfaces, both photographically and visually. The experiments were made without filters, as well as with yellow, green, and blue filters. The light transmission of several immersion oils was investigated. Tables, charts, and micrographs. (M21)

231-M. Nodules and Nuclei in Nodular Cast-Iron. Part II. (Concluded.) J. E. Rehder. *American Foundryman,* v. 21, May 1952, p. 87-90.

Size distribution, chemical analysis, and X-ray diffraction studies at Canadian Department of Mines & Technical Surveys. (M27, CI)

232-M. Electron Microstructure of Bainite in Steel. *ASTM Bulletin,* May 1952, p. 62-65. (A condensation. To be published in full in preprint of Report of ASTM Committee E-4 on Metallography.)

A study of the isothermal transformation products formed within the bainite range between 500 and 950° F. The steel used contained 0.39% Ni and 0.21% Cr. Table and electron micrographs. (M27, AY)

233-M. Optical Microscopy: an Adjunct to Engineering and Research. F. G. Foster. *Bell Laboratories Record,* v. 30, June 1952, p. 253-260.

Includes technique in metallurgical microscopy. Photographs and photomicrographs. (M21)

234-M. The Resolution of the Metallurgical Microscope. E. Wilfred Taylor. *Bulletin of the Institute of Metals,* v. 1, May 1952, p. 77-79. (Bound with *Journal of the Institute of Metals,* v. 80, May 1952.)

Use of the ultraviolet microscope for increasing resolution in metallurgical work. Photomicrographs. (M21)

235-M. The Alloys of Molybdenum and Tantalum. G. A. Geach and D. Summers-Smith. *Journal of the Institute of Metals,* v. 80, May 1952, p. 528.

A discussion by S. F. Radtke, W. C. Schumb, and M. B. Bever of above article (Nov. 1951 issue.) See item 2-M, 1952. (M24, Mo, Ta)

236-M. Titanium-Aluminum System. E. S. Bumps, H. D. Kessler, and M. Hansen. *Journal of Metals,* v. 4, June, 1952: *Transactions of American Institute of Mining and Metallurgical Engineers,* v. 194, 1952, p. 609-614.

The Ti-rich end of the Ti-Al phase diagram was determined to the compound $TiAl_3$ (62.7% Al). Micrographic analysis and X-ray diffraction were the chief methods used. 10 ref. (M24, Ti, Al)

237-M. Partial Titanium-Vanadium Phase Diagram. Paul Pietrokowsky and Pol Duwez. *Journal of Metals,* v. 4, June, 1952: *Transactions of American Institute of Mining and Metallurgical Engineers,* v. 194, 1952, p. 627-630.

Preparation of alloys and of experimental procedure. Results led to establishment of the constitution diagram between 980 and 650° C. Typical microstructures; graphical data. (M24, Ti, V)

238-M. Crystal Structure of ZrB_{12}. Benjamin Post and Frank W. Glaser. *Journal of Metals,* v. 4, June 1952: *Transactions of American Institute of Mining and Metallurgical Engineers,* v. 194, 1952, p. 631-632.

Investigated using powder diffraction. Graph and diagram. (M26, Zr, B)

239-M. Crystallographic Angles for Titanium and Zirconium. Carl J. McHargue. *Journal of Metals,* v. 4, June 1952; *Transactions of American Institute of Mining and Metallurgical Engineers,* v. 194, 1952, p. 660.

Calculated crystallographic angles are tabulated and shown graphically. (M26, Ti, Zr)

240-M. Furnace Construction and Thermocouple Arrangements for a High Temperature X-Ray Camera. Z. S. Basinski, W. B. Pearson, and J. W. Christian. *Journal of Scientific Instruments,* v. 29, May 1952, p. 154-155.

Modifications enable the actual specimen temperature to be measured accurately in the range 700-1000° C. Temperatures are measured and controlled by means of two rigidly fixed ring thermocouples of new design. (M23, S16)

241-M. Survey of Portions of the Chromium-Cobalt-Nickel-Molybdenum Quaternary System at 1200° C. Sheldon Paul Rideout and Paul A. Beck. *National Advisory Committee for Aeronautics,* Technical Note 2683, Apr. 1952, 81 pages.

Microscopic and X-ray diffraction studies. Solid-solubility limits of the quaternary alpha phase were determined up to 20% Mo. The component Co-Ni-Mo, Cr-Cr-Mo, and Cr-Ni-Mo ternary systems were also studied. (Survey of these systems was confined to determination of the boundaries of the face-centered cubic (alpha) solid solutions and of the phases co-existing with alpha at 1200° C.) 24 ref. (M24, Cr, Co, Ni, Mo)

242-M. Growth Spirals Originating From Screw Dislocations on Gold Crystals. S. Amelinckx. *Philosophical Magazine,* ser. 7, v. 43, May 1952, p. 562-567.

Observations of growth spirals on faces of gold crystals, obtained by precipitation, prove that Frank's theory also holds for metal crystals. These observations constitute the first visual proof for the presence in metal crystals of dislocations in general, and screw dislocations in particular. They further show that the Burgers vector of dislocations in metals is not necessarily limited to one unit of a few simple lattice displacements, as is generally assumed. Diagrams. 16 ref. (M26, Au)

243-M. Nuclear Resonance and the Electronic Structure of Transition Metals. W. D. Knight and C. Kittel. *Physical Review,* ser. 2, v. 86, May 15, 1952, p. 573.

Discusses recent work. (M25, P10)

244-M. On the Tantalum-Oxygen System. (In English.) Stig Lagergren and Arne Magneli. *Acta Chemica Scandinavica,* v. 6, no. 3, 1952, p. 444-446.

Starting materials for the investigation were Ta powder and Ta_2O_5, weighed amounts of which were intimately mixed, pressed, and heated in vacuo. The products were investigated by taking X-ray powder photographs. (M24, H general, Ta)

245-M. The Structure of the σ Phase in Vanadium-Nickel Alloys. (In English.) W. B. Pearson and J. W. Christian. *Acta Crystallographica,* v. 5, Mar. 1952, p. 157-162.

See abstract under similar title from *Nature,* item 66-M, 1952. (M26, V, Ni)

246-M. The Crystal Structure of Ti_3Au and Ti_3Pt. (In English.) Pol Duwez and Charles B. Jordan. *Acta Crystallographica,* v. 5, Mar. 1952, p. 213-214.

Powder patterns indicate that Ti_3Au and Ti_3Pt crystallize in the A-15 (β-wolfram) structure with lattice parameters of 5.096 and 5.033 A, respectively. (M26, Ti, Au, Pt)

247-M. The Crystal Structure of β-Monoclinic Selenium. (In English.) Robinson D. Burbank. *Acta Crystallographica,* v. 5, Mar. 1952, p. 236-246.

Determined by application of Herker-Kasper phase inequalities and two-dimensional Fourier syntheses. Diffraction data demonstrate that a single crystal of β-Se can transform directly into metallic Se. During the transition, the molecules are broken down into smaller fragments which recombine to form the infinitely long helical chains of metallic Se. Relations between mixed crystals of S and Se, and between the various polymorphs of Se. 21 ref. (M26, Se)

248-M. The Crystal Structure of the Cadmium-Magnesium Alloy, CdMg. (In English.) H. Steeple. *Acta Crystallographica,* v. 5, Mar. 1952, p. 247-249.

Unit-cell dimensions; also atomic-scattering factors for both Cd and Mg at room temperature. (M26, P10, Cd, Mg)

249-M. A Stroboscopic Effect in the X-Ray Analysis of Crystalline Aggregates. (In English.) H. J. Goldschmidt. *Acta Crystallographica,* v. 5, Mar. 1952, p. 256-259.

An X-ray diffraction technique, based on observation of a stroboscopic effect which results from synchronism between the speed of specimen rotation and pulse frequency of the incident X-ray beam. The effect consists in regular striation occurring at inclinations varying among diffraction spots; these striations can be caused to disappear by heat treatment. Structural details of a crystalline mass are revealed, which would otherwise not be apparent. A photograph showing striations gives simultaneously orientation and lattice spacing of a given crystallite, and allows differentiation between different crystal sizes. One potential application is to distinguish between strain and small particle size as causes of line broadening. (M22)

250-M. Use of the Electron Microscope in the Investigation of Metal Surfaces. I. Progress in Preparation Techniques. (In Dutch.) V. Ch. Dalitz and J. A. Schuchmann. *Metalen,* May 15, 1952, p. 153-161.

A convenient and rapid method for getting useful positive replicas from metal surfaces. An etched metal is placed in a high-vacuum bell jar and a thick layer of silver is deposited upon it by evaporation from a small crucible. This layer can easily be removed from various metals. The negative silver replica is coated with a thin film of SiO in vacuum. A still better positive replica results upon polymerization of a hydrocarbon upon the silver in a glow discharge. The silver is dissolved in HNO_3 and a shadow is applied. (M21)

251-M. Laminated Structure. (In French.) M. Remy. *Circulaire d'Informations Techniques,* v. 9, May 1952, p. 682-698.

The band structure of various types of steel, such as Cr-Mo (18-CD4), Cr-Ni (16-NC-11), and Cr-Ni-Mo (30-NCD-16). Various examples of such structure and factors in-

fluencing its formation. Relationship between structure and mechanical properties. Micrographs. 18 ref. (M27, Q24, SS)

252-M. The Appearance of Preferred Orientation (112) in Plastically Deformed and Recrystallized Copper. (In French.) Paul Bastien and Jean Pokorny. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences,* v. 234, Apr. 1952, p. 1780-1782.

Results of investigation are compared with those of other investigators. (M26, N5, Cu)

253-M. Some Physical, Chemical, and Structural Phenomena Which Affect Mechanical Properties at Elevated Temperatures of Heat Resistant Austenitic Alloys. (In French.) P. Chevenard and X. Wache. *Schweizer Archiv für angewandte Wissenschaft und Technik,* v. 18, Apr. 1952, p. 127-136.

Various methods for investigation. Results of application to various alloys of the above type are charted and tabulated. (M27, Q general, SS, SG-h)

254-M. The Molybdenum-Silicon System. (In German.) Richard Kieffer and Ernst Cerwenka. *Zeitschrift für Metallkunde,* v. 43, Apr. 1952, p. 101-105.

Production of alloys in above system by powder metallurgy and determination of phase relationships, hardness, and scaling resistance. Micrographs, macrographs, tables, and graphs. 20 ref. (M24, Mo, Si)

255-M. Systematization of the Structures of Alloys in Relation to the Heat of Formation. (In German.) Ulrich Dehlinger. *Zeitschrift für Metallkunde,* v. 43, Apr. 1952, p. 109-111.

Examination of principal structures shows that alloys can be placed into two classes, namely those with dense structures and alloys of open structure formed by heteropolar bonding. The latter include the Hume-Rothery alloys and the Zintl alloys. These two classes differ greatly in effect of atom concentration on heat of formation. Tables. (M26, P12)

256-M. Alloys of Titanium With Copper, Silver, and Gold. (In German.) Ernst Raub, Paul Walter, and Max Engel. *Zeitschrift für Metallkunde,* v. 43, Apr. 1952, p. 112-118.

Constitution diagrams were determined with the aid of thermal, microscopic, and X-ray investigations. Structures and properties of the nine systems of the metals of the 1st and 4th subgroup of the periodic system are compared. Only Cu and Au are found to alloy with Ti, while either solid or molten Ag is practically immiscible in Ti. Tables, graphs, and photomicrographs. 10 ref. (M24, Cu, Ag, Au)

257-M. Red-Tinted Alloys in the Copper-Zinc-Aluminum System. (In German.) Franz Lihl. *Zeitschrift für Metallkunde,* v. 43, Apr. 1952, p. 124-126.

In alloys with 30-50% Zn, increasing the Al content changes the color from light yellow to copper-red, which is ascribed to the β-phase. Tables and graphs show that the color effect of Al varies with the Zn content. (M24, P17, Al, Cu, Zn)

258-M. Quantum Mechanics of the Cubic Body-Centered Structures of the Transition Metals. (In German.) K. Ganzhorn. *Zeitschrift für Naturforschung,* v. 7a, Mar.-Apr. 1952, p. 291-292.

The contribution of d-electrons to bonding in the body-centered lattice can be explained by determining their configuration in the body-centered cubic lattice with the aid of group-theoretical considerations. (M26)

259-M. The Surface-Active Components of Steel. (In Russian.) S. M. Baranov. *Doklady Akademii Nauk SSSR,* new ser., v. 83, Mar. 1, 1952, p. 125-128.

The influence of silicates with high and low contents of Si on the microstructure and crystal structure of low-alloy structural steels. Photomicrographs. (M26, M27, AY)

260-M. The Al-Cu-Mg System. (In Russian.) G. G. Urazov and M. S. Mirgalovskaia. *Doklady Akademii Nauk SSSR,* new ser., v. 83, Mar. 11, 1952, p. 247-250.

A study was made of the phases of the above system. A new ternary composition diagram was prepared. Three sections of the new diagram are illustrated. (M24, Al, Cu, Mg)

261-M. Grain Shapes and Other Metallurgical Applications of Topology. Cyril Stanley Smith. *American Society for Metals,* "Metal Interfaces", 1952, p. 65-108; disc., p. 108-113.

Previously abstracted from *American Society for Metals,* Preprint 37, 1951; item 250-M, 1951. (M27, N3)

262-M. Effect of Included Oxide Films on the Structure of the Beilby Layer. A. J. W. Moore and W. J. McG. Tegart. *Proceedings of the Royal Society,* ser. A, v. 212, May 22, 1952, p. 458-459.

Experiments show that, during repeated sliding, oxide is included to a considerable depth beneath the surface of the metal. Subsequent annealing at high temperatures shows that the included oxide particles prevent grain growth in the surface layers. This process may be largely responsible for the fine grain size of the Beilby layer. (M27, Q9)

263-M. Formation of Lubricant and Other Films on Clean Metal Surfaces: a Study by Electron Diffraction. R. Courtel. *Proceedings of the Royal Society,* ser. A, v. 212, May 22, 1952, p. 459-462.

Details of apparatus under construction under auspices of IRSID (Institut des Recherches Sidérurgiques Francaises) which is to be used for extending above investigations. (M22, P10)

264-M. A Dynamical Model of a Crystal Structure. IV. Grain Boundaries. W. M. Lomer and J. F. Nye. *Proceedings of the Royal Society,* ser. A, v. 212, May 22, 1952, p. 576-584.

Four photographs of bubble rafts, used as a basis for discussion of the structure of grain boundaries in pure metals, show the gradual transition from a small-angle boundary made up of clearly separate dislocations to a large-angle boundary where the dislocation structure is hardly recognizable. As the angle is increased, a continuous shortening of the dislocations, accompanied by the widening of a crack on the tensile side, is seen, and the process culminates in a structure which is described in terms of local fit and misfit. Range of validity of calculations of energy of dislocation walls, and slip and diffusion along grain boundaries. 21 ref. (M27)

N

TRANSFORMATIONS AND RESULTING STRUCTURES

165-N. Kinetics of Crystalline Nucleus Formation in Supercooled Liquid Tin. Guy M. Pound and Victor K. La Mer. *Journal of American Chemical Society,* v. 74, May 5, 1952, p. 2323-2332.

Oxide-coated droplets of molten Sn of a narrow size range were supercooled to 120° C. below their melting point. The specimens each consisted of several grams or about 10^{10} of the droplets. Rate of nucleation of crystals in the droplets was measured dilatometrically as a function of temperature and droplet size. The nucleation process appears to be inhomogeneous. Nucleating impurities are shown to be present in amounts proportional to droplet area rather than volume. Two different theoretical equations for heterogeneous nucleation rate fit the data. Minimum solid-liquid interfacial free energy and kinetic coefficient for heterogeneous nucleation were calculated from the data. Tables and graphs. 15 ref. (N2, N12, Sn)

166-N. p-n Junction Method for Measuring Diffusion in Germanium. W. C. Dunlap, Jr., and D. E. Brown. *Physical Review,* ser. 2, v. 86, May 1, 1952, p. 417-418.

Diffusion of an n-type impurity into a p-type semiconductor creates a p-n junction which can be detected electrically by the thermoelectric effect of a hot needle or by a rectification probe. Study of the rate of penetration of the p-n junction into the semiconductor can be used to measure the diffusion coefficients of various impurities in such semiconductors as Ge or Si. Object of the work described was to establish validity of the method by direct measurement of diffusion, by the p-n junction method, and by the radioactive-tracer method. Sb was the impurity studied. Graphs. (N1, Ge)

167-N. Low Temperature Properties of Tin, Soft Solders and Soft Soldered Joints. H. C. Watkins. *Research,* v. 5, May 1952, p. 231-234.

White tin undergoes transformation to the gray allotrope at low temperatures. It was thought that this might cause failure in soldered joints. Shows that the change may be inhibited or retarded by the addition of traces of certain metals. Gives optimum compositions for solders which are to be subjected to low-temperature conditions. (N6, K7, Sn)

168-N. Isotopic Exchange Between Metallic Silver and Its Ions in Solution. (In French.) Maria do Carmo Anta and Maurice Cottin. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences,* v. 234, Apr. 21, 1952, p. 1686-1688.

The Ag-$AgNO_3$ system was investigated, using the powdered silver isotope Ag^{110}. Conclusions exclude the possibility that rate of exchange is determined by self-diffusion in the metallic phase. (N1, Ag)

169-N. The Phenomenon of Structural Precipitation. (In French.) *Journal d'Informations Techniques des Industries de la Fonderie,* Feb. 1952, p. 17-21.

Micrographic structure resulting from precipitation. Various consequences. Applies to Al-Cu alloys in particular. Tables and micrographs. (N7, Al, Cu)

170-N. Are Our Hot-Stream Structural Parts Being Endangered by Graphitization? (In German.) Cl. Holzhauer. *Brennstoff-Wärme-Kraft,* v. 4, Apr. 1952, p. 134-135.

The graphitization problem, and the tendency of different types of alloy steels toward graphite formation. (N8, AY, ST)

171-N. Hydrogen Diffusion; Process in Iron and Iron Alloys at Elevated Temperatures. P. L. Chang and

W. D. G. Bennett. *Iron & Steel,* v. 25, May 17, 1952, p. 240-243 disc., p. 261-264.

Previously abstracted under similar title from *Journal of the Iron and Steel Institute.* See item 128-N, 1952. (N1, Fe, ST)

172-N. Ingots and Forgings; Distribution of Hydrogen. J. D. Hobson and C. Sykes. *Iron & Steel,* v. 25, May 17, 1952, p. 243-245; disc., p. 261-264.

Previously abstracted under similar title from *Journal of the Iron and Steel Institute.* See item 73-N, 1952, p. 118-122. (N12, D9, ST)

173-N. The Ageing Characteristics of Ternary Aluminium-Copper Alloys With Cadmium, Indium, or Tin. H. K. Hardy. *Journal of the Institute of Metals,* v. 80, May 1952, p. 483-492.

Hardness vs. aging-time curves were obtained between 30 and 240° C. for Al-Cu alloys containing 2, 3, or 4% Cu with 0.01 or 0.05% In or Sn. Includes thermodynamic analysis of short-range ordering in ternary solid solutions. Graph and tables. 39 ref. (N7, M26, Q29, Al)

174-N. Stress-Recovery in Aluminium. W. A. Wood and J. W. Suiter. *Journal of the Institute of Metals,* v. 80, May 1952, p. 501-506.

Changes in strength and structure were observed during the deformation of Al in which the grains had already been broken down to a fine substructure by previous straining. "Stress-recovery" refers to the new structural growth effects produced by simultaneous heating and straining which are of an order of magnitude greater than that obtainable by heating alone. Graphs, diagrams, photomicrographs, and X-ray photographs. 17 ref. (N4, Q24, Al)

175-N. Allotropic Transformation in Titanium-Zirconium Alloys. Pol Duwez. *Journal of the Institute of Metals,* v. 80, May 1952, p. 525-527.

In Ti-Zr alloys, transformation from the high-temperature body-centered cubic β solid solution to the low-temperature hexagonal close-packed α solid solution is shown to take place, at least partially, at all compositions and at rates of cooling as high as 8000° C. per sec. Transformation is not complete; the amount of β solid solution retained is a maximum in alloys containing 50 at. % of each metal. Graphs. (N6, Ti, Zr)

176-N. Volume Change at the Ar_3 Transformation. A. H. Smith and F. C. Thompson. *Journal of the Iron and Steel Institute,* v. 171, May 1952, p. 38-40.

In view of the great discrepancies between results obtained by earlier workers, the volume change associated with the $\gamma \rightarrow \alpha$ transformation was redetermined for a specially pure Armco iron, and found to be 1.16%. This figure is in good agreement with that derived from X-ray data. Since this value should be about 9% if the iron ion is the same size in both the γ and α forms, a significant change in ion size must occur, as is expected from the alteration in coordination number. It was found that this change amounts to a contraction of 2.4% of the ionic radius at the Ar_3 inversion, which agrees well with Goldschmidt's figures. (N6, P10, Fe)

177-N. Microscopical Studies on the Iron-Nickel-Aluminium System. Part III. Transformations of the β and β' Phases. A. J. Bradley. *Journal of the Iron and Steel Institute,* v. 171, May 1952, p. 41-47.

Photomicrographs illustrate the reactions that take place when the body-centered cubic structures of the Fe-Ni-Al system break up during cooling. The decomposition may take place either by deposition of the face-centered cubic lattice, or by its splitting into two phases, one ordered, the other disordered. The former process is predominant at higher temperatures, and the latter at lower temperatures. High coercivity is exclusively connected with incipient breakdown of the nonmagnetic NiAl-rich ordered structure, which must remain predominant in order to form a continuous matrix. Under the most favorable circumstances, this precipitate consists entirely of the lamellar ferromagnetic Fe-rich β-phase. Discusses Fe_2NiAl-type of permanent-magnet alloy. 25 ref. (N6, P16, Fe, Ni, Al, SG-n)

178-N. Occurrence of Sigma Phase in a High Chromium-Nickel Steel and the Effect of Carbon Content. R. E. Lismer and K. W. Andrews. *Journal of the Iron and Steel Institute,* v. 171, May 1952, p. 49-58.

Effect of 0.06-0.29% C on sigma-phase formation in a commercial 25-15 Cr-Ni steel. Mode of formation of sigma phase from duplex austenite-ferrite, austenite-carbide, or austenite structures was investigated by consideration of changes produced by heating at 700 and 900° C. for periods of up to 2000 hr. after solution treatment over temperatures from 950 to 1250° C. Results of microscopical and X-ray examination. Etching characteristics of the various phases and constituents that may be present. 13 ref. (N8, M27, SS)

179-N. Heterogeneous Nucleation of Graphite in Hypo-Eutectoid Steels. W. E. Dennis. *Journal of the Iron and Steel Institute,* v. 171, May 1952, p. 59-63.

Effects of different atmospheres during graphitization, and of prior heat treatment in the austenitic range, upon reaction rate. It was found that the rapid graphitization of these steels is caused by heterogeneous nucleation of graphite by alumina dispersions formed by internal oxidation during graphitization. Rate of nucleation seems to be dependent on the extent to which the residual Al is segregated prior to graphitization. 22 ref. (N2, N8, CN)

180-N. Recrystallization of Tantalum. G. W. Wench, K. B. Bruckart, and R. H. Deibler. *Journal of Metals,* v. 4, June 1952, p. 596.

Primary recrystallization kinetics of high-purity Ta (99%), which had been reduced 40% in thickness by cold rolling, were studied and kinetic relations determined. (N5, Ta)

181-N. Diffusion and Precipitation of Carbon in Some Alloys of Iron. Charles Wert. *Journal of Metals,* v. 4, June, 1952: *Transactions of American Institute of Mining and Metallurgical Engineers,* v. 194, 1952, p. 602-603.

Studied in Fe and in alloys containing small amounts of Ni, Mo, Cr, Mn, and V, by observing shape and position of the internal-friction peak at 0.9 cycle per sec. (N1, N7, Fe)

182-N. Transformation in Cobalt-Nickel Alloys. J. B. Hess and C. S. Barrett. *Journal of Metals,* v 4, June, 1952; *Transactions of American Institute of Mining and Metallurgical Engineers,* v. 194, 1952, p. 645-647.

A curve was determined showing the temperatures at which deformation begins to transform the cubic phase to the hexagonal phase in Co-rich Co-Ni alloys. A similar curve was determined for the strain-induced reverse transformation in the same alloys. The two curves agreed within experimental error and thus determine a curve of equal stability, which is also judged to be the curve giving equal free energy for the phases when they have the same composition. (N6, Q24, Co, Ni)

183-N. Effect of Applied Stress on the Martensitic Transformation. S. A. Kulin, Morris Cohen, and B. L. Averbach. *Journal of Metals,* v. 4, June, 1952; *Transactions of American Institute of Mining and Metallurgical Engineers,* v. 194, 1952, p. 661-668.

The martensitic transformation can be initiated by elastic stresses at temperatures above M_s in a steel containing 20% Ni and 0.5% C. Shear strains and normal tensile strains acting on a potential habit plane promote the transformation, but compressive strains oppose it. Graphs and micrographs. 23 ref. (N8, SS)

184-N. Some Factors in the Growth of Crystals. Dan McLachlan, Jr., Allan Carlson, Carl J. Christensen, and Alan King. *Utah Engineering Experiment Station,* Bulletin 57, Jan. 1952, 62 pages. (*Bulletin of the University of Utah,* v. 42, no. 9).

A theoretical, mathematical presentation. Extensions of the Donnay-Harker Law; crystal growth from solution; dendritic growth; and evolutionary aspects of crystal growth. 21 ref. (N12)

185-N. Growth and Crystallography of Deformation of β-Phase Uranium Single Crystals. (In English.) A. N. Holden. *Acta Crystallographica,* v. 5, Mar. 1952, p. 182-184.

Single crystals of the tetragonal β-phase of U were grown in material containing small amounts of Cr by a $\gamma \rightarrow \beta$ phase-transformation method. These crystals could be retained in a metastable condition for long periods following their quenching from normal β-phase temperatures into water at room temperature. (N12, M26, U)

186-N. New Type of Graphitization of Cast Iron Cooled Through Eutectoid Range. (In English.) Keizo Iwase. *Japan Science Review,* v. 2, Aug. 1951, p. 189-196.

Purpose of study was to clarify the mechanism of formation of free ferrite in the "bull's eye" structure sometimes observed in blackheart malleable cast irons and in nodular cast irons, as well as in some pearlitic gray cast irons. Believes that such formation of free ferrite is caused by "lateral" Ar_1 transformation and that precipitation of graphite from free ferrite is a necessary condition. Graphs and micrographs. (N8, CI)

187-N. Influence of Adsorption of Gases on the Surface Transformation of a Martensitic Structure by Tempering a Hardened Steel. (In French.) Joseph Maurer. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences,* v. 234, Apr. 28, 1952, p. 1773-1775.

Variation in rate of the martensite-pearlite transformation with type of atmosphere present was studied. The effect is due to adsorption of gas at the surface of the crystalline lattice. Gases studied were H_2, Ne, A, and CO_2. The steel contained 0.8% C. Graphs. (N8, ST)

188-N. Effect of Extremely High Cooling Rates on the Solidification and Structure of Binary Alloys. (In German.) Günter Falkenhagen and Wilhelm Hofmann. *Zeitschrift für Metallkunde,* v. 43, Mar. 1952, p. 69-81.

Preparation of supersaturated solid solutions of binary alloys by sudden quenching at extremely high temperatures. The X-ray back-reflection process was used to determine the amount of solute in solution. Alloys studied were Al-Ti, Al-V, Al-Cr, Al-Mn, Al-Fe, Pb-Na, Pb-Te, Pb-Ca, and Cu-Cr. Diagrams, tables, graphs, micrographs, and X-ray diagrams. 53 ref. (N12, Al, Pb, Cu)

189-N. Remarks on the Appearance of Sweating Out in Ingots. (In Ger-

man.) Voya Kondic, William Shakespeare, and Geoffrey James Shaw. *Zeitschrift für Metallkunde,* v. 43, Mar. 1952, p. 95-97.

Experiments on various ferrous and nonferrous metals and alloys made to test the assumption that sweating out is caused by different forces, such as hydrostatic forces, gas pressure, shrinkage pressure, and capillary forces. Authors believe that this effect is primarily caused by shrinkage stresses under certain solidification conditions. Diagram, tables, and photomicrographs. (N12, D9, C5)

190-N. Research on Grain Growth in the Primary Recrystallization of Slightly Deformed Aluminum Foil. (In German.) Klaus Eickhoff and Kurt Lücke. *Zeitschrift für Metallkunde,* v. 43, Apr. 1952, p. 118-124.

Annealed, rolled, pure-Al foil further reduced 4-7%, and recrystallized at 350-400° C., revealed very slight formation of nuclei, which made it easy to measure rate of grain growth. Results are compared with those of other authors and conclusions on mechanism of grain growth are discussed. Several special phenomena accompanying grain growth. Tables, graphs, and photographs. 13 ref. (N3, Al)

191-N. The Problem of the Influence of Quenching Temperature of Steel on the Amount of Residual Austenite. (In Russian.) V. D. Sadovskii and G. N. Bogacheva. *Doklady Akademii Nauk SSSR,* new ser., v. 83, Mar. 11, 1952, p. 221-222.

Data from experiments with a steel containing 1.2% C, 0.20% Mn, and 6.0% Ni are claimed to prove that the conclusions of Harris and Cohen on the effect of quenching temperature on residual austenite are in error and that graphitization is the cause of the observed phenomena. Data are tabulated. (N8, J26, AY)

192-N. Boundary Migration During Grain Growth. R. L. Fullman. *American Society for Metals,* "Metal Interfaces", 1952, p. 179-207.

An extension of the quantitative analysis of grain-growth kinetics, using more detailed models than have been applied previously. An elementary theory previously developed leads to the prediction that grain diameter should be approximately proportional to the square root of the annealing time during isothermal annealing. Elementary theory adequately describes the growth of froth cells, but in metals, grain diameter is frequently proportional to the annealing time raised to a power which generally differs from ½. Examines extent to which various factors may alter the grain-growth exponent predicted by theory. 55 ref. (N3)

193-N. Interface Migration in Recrystallization. Paul A. Beck. *American Society for Metals,* "Metal Interfaces", 1952, p. 208-247.

The most important variables affecting rate of interface migration in recrystallization, and certain features of the more recently discovered types of interface migration, closely connected with recrystallization phenomena. Micrographs, also tables and graphs. 67 ref. (N5)

194-N. Phase Transformation at Interfaces. Alfred H. Geisler. *American Society for Metals,* "Metal Interfaces", 1952, p. 269-295; disc., p. 295-298.

Theoretical analysis and experimental observations indicate that a nodular process that is nucleated almost exclusively at grain boundaries is found with all three main types of transformations in solid solutions. The process consists of formation of a recrystallized ordered phase in the order-disorder reaction, of a recrystallized matrix plus incoherent precipitate in the precipitation reaction, and of two new incoherent phases in the eutectoid reaction. 41 ref. (N general, P10)

195-N. (Book) **Diffuziia v Metallakh i Splavakh.** (Diffusion in Metals and Alloys.) V. Z. Bugakov. 212 pages. 1949. Government Publishing House for Technical-Theoretical Literature, Moscow and Leningrad, U.S.S.R.

Results of investigations by the author and co-workers. Divided into two principal sections: Atomic diffusion and reactive diffusion. The latter includes a subsection on the reaction of iron with molten zinc (theory of zincification of iron.) Graphs and tables. 101 ref. (N1, L16, Zn, Fe)

P

PHYSICAL PROPERTIES AND TEST METHODS

301-P. Thermal Conductivity Coefficients; New French Method of Determination in Metals. *Chemical Age,* v. 66, May 3, 1952, p. 695-696. (From paper by Edmond Rousseau, *Chimie et Industrie,* v. 67, No. 2, 1952, p. 242-248.)

Includes apparatus diagram for new calorimetric procedure. (P11)

302-P. Nickel Oxides; Relation Between Electrochemical Reactivity and Foreign Ion Content. Robert L. Tichenor. *Industrial and Engineering Chemistry,* v. 44, May 1952, p. 973-977.

Theoretical explanation of the electrochemical effects of adding Li, Bi, and Fe to the Ni electrode of alkaline storage batteries. Explains how these metals affect the electrode. (P15, R5, Ni)

303-P. The Heat Capacity and Entropy of Gold From 15 to 300° K. T. H. Geballe and W. F. Giauque. *Journal of American Chemical Society,* v. 74, May 5, 1952, p. 2368-2369.

Heat capacity at constant volume was calculated and compared with the Debye equation. Results, compared with those on several other face-centered-cubic metal crystals, show that the distribution of vibrational frequencies is characteristic of each metal. Entropy, heat content, and free energy are tabulated. (P12, Au)

304-P. The Mechanism of Hydrogen Evolution at Nickel Cathodes in Aqueous Solutions. J. O'M. Bockris and E. C. Potter. *Journal of Chemical Physics,* v. 20, Apr. 1952, p. 614-628.

Hydrogen overpotential at Ni cathodes was measured under very pure conditions. Observations were also made of buildup and rate of decay of overpotential and of capacity of the electrode-electrolyte interface. The most probable mechanism of hydrogen overpotential at Ni cathodes is that of a rate-determining discharge step followed by a recombination of hydrogen atoms. Apparatus diagrams, graphs, and tables. 30 ref. (P15, Ni)

305-P. The Heat Capacities of Uranium, Uranium Trioxide, and Uranium Dioxide From 15° K to 300° K. W. M. Jones, Joseph Gordon, and E. A. Long. *Journal of Chemical Physics,* v. 20, Apr. 1952, p. 695-699.

Data were obtained in 1942 by a calorimetric method. A maximum was observed at 28.7° K. in the heat capacity curve of UO_2, which is probably a result of the changing population of the magnetic quadrivalent uranium ions among their available energy states. Entropies and free energies of formation are given. Tables and graphs. 17 ref. (P12, U)

306-P. Recoil Atoms From Slow Neutron Capture by Gold and Indium Surfaces. Samuel Yosim and T. H. Davies. *Journal of Physical Chemistry,* v. 56, May 1952, p. 599-603.

Au and In recoil atoms were caught on an opposed collector. Yields of radioactive recoils were determined with and without electric fields and indicate recoil path lengths in the solid of no more than several lattice layers. Apparatus diagram, graphs, and tables. 18 ref. (P10, Au, In)

307-P. Oxide Film Formation on the Surface of Metallic Mercury in Aqueous Solutions and the Anomaly Between Its Potential and That of the Mercury-Mercuric Oxide Electrode. S. E. S. El Wakkad and T. M. Salem (Mrs. S. E. S. El Wakkad). *Journal of Physical Chemistry,* v. 56, May 1952, p. 621-625.

Studied by the anodic behavior of Hg utilizing both the cathode-ray-oscillograph method and the direct potentiometric method and by the effect of bubbling O_2 through the solution. Apparatus diagram and oscillograms. 11 ref. (P15, Hg)

308-P. Adsorption of Oxygen on Silver. F. H. Buttner, E. R. Funk, and H. Udin. *Journal of Physical Chemistry,* v. 56, May 1952, p. 657-660.

Results of determinations of the surface tension of solid Ag in pure He and in an atmosphere of controlled He-O_2 mixtures. Apparatus diagrams, graphs, and 10 ref. (P13, Ag)

309-P. Magnetic Domains on Silicon Iron by the Longitudinal Kerr Effect. C. A. Fowler, Jr., and E. M. Fryer. *Physical Review,* ser. 2, v. 86, May 1, 1952, p. 426.

Observations of Kerr effects were made by illuminating the surface with a small optical probe, passing the reflected beam through a nicol analyzer and measuring the intensity of the transmitted light with a sensitive multiplier phototube circuit. Results seem comparable with the magnetic powder patterns obtained by Williams, Bozorth, and Shockley. (P16, Fe)

310-P. Effect of Torsion on a Longitudinally-Magnetized Iron Wire. *Wireless Engineer,* v. 29, May 1952, p. 115-117.

Summarizes two communications recently received from W. V. Dromgoole of New Zealand. Results of experiments are summarized and practical applications are suggested in connection with torque measurement and transmission of data in conversion of mechanical movements into electrical signals of varying amplitude and phase. Magnitude of the effect appears to be a function of permeability. Diagrams and graphs. (P16, Fe)

311-P. The Adsorption of Cations by Metals, Demonstrated by Use of Radioactive Tracers. (In French.) Julio Palacios and A. Baptista. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences,* v. 234, Apr. 21, 1952, p. 1676-1677.

Theoretical and experimental study based on the hypothesis that the potentials of electrodes are produced by adsorption of cations. Wires of Pt, Pd, Au, Ag, Cu, Pb, and Fe were immersed for definite periods in $Zn^{65}SO_4$, removed and washed, then studied with a Geiger counter to determine the amount of adsorption which took place. (P13, P15)

312-P. The Thermo-Electric Power of Very Thin Strips of Aluminum. (In French.) Jean Savornin and Georges Couchet. *Comptes Rendus*

hebdomadaires des Séances de l'Académie des Sciences, v. 234, Apr. 16, 1952, p. 1608-1610.

Thermo-electric power of Al-Cu couples formed between vacuum-deposited thin films of Al on sheet glass and pure Cu wires was determined between 0 and 300° C. as a function of film thickness. Tables and graphs. (P15, Al, Cu)

313-P. Electrochemical Equilibria. (In French.) M. Pourbaix. "International Committee on Electrochemical Thermodynamics and Kinetics; Proceedings of the 2nd Meeting" (Libreria Editrice Politecnica Cesare Taburini, Milan, Italy), 1951, p. 11-14; disc., p. 14.

A brief report on the thermodynamics of electrochemical reactions and electrochemical equilibrium diagrams, describing their use. 13 ref. (P15)

314-P. Potential-pH Diagram of Lead. Electrochemical Behavior and Corrosion of Lead. Lead Batteries. (In French.) P. Delahay, M. Pourbaix, and P. Van Rysselberghe. "International Committee on Electrochemical Thermodynamics and Kinetics; Proceedings of the 2nd Meeting" (Libreria Editrice Politecnica Cesare Taburini, Milan, Italy), 1951, p. 15-28.

The electrochemical equilibrium diagrams of the Pb-H_2O system, and of the Pb-CO_2-H_2O and Pb-SO_4-H_2O systems are established as a function of pH and potential. These diagrams are applied to a study of the electrochemical behavior of Pb and its compounds; to the study of corrosion, passivation, and passivity of Pb; and to the study of lead cells. Diagrams and graphs. 11 ref. (P15, R1, Pb)

315-P. Potential-pH Diagram of Silver. Electrochemical Behavior and Corrosion of Silver. (In French.) P. Delahay, M. Pourbaix, and P. Van Rysselberghe. "International Committee on Electrochemical Thermodynamics and Kinetics; Proceedings of the 2nd Meeting" (Libreria Editrice Politecnica Cesare Taburini, Milan, Italy), 1951, p. 29-33.

The electrochemical equilibrium diagram of the Ag-H_2O system was established as a function of the pH and the potential. This diagram was applied to a study of the electrochemical behavior of Ag and its compounds, and to a study of the corrosion of Ag. Diagrams. (P15, R1, Ag)

316-P. Potential-pH Diagram of Zinc. Electrochemical Behavior and Corrosion of Zinc. (In French.) P. Delahay, M. Pourbaix, and P. Van Rysselberghe. "International Committee on Electrochemical Thermodynamics and Kinetics; Proceedings of the 2nd Meeting" (Libreria Editrice Politecnica Cesare Taburini, Milan, Italy), 1951, p. 34-41.

The electrochemical equilibrium diagrams of the Zn-H_2O and Zn-CO_2-H_2O systems are established as a function of the pH and potential. They are applied to study of the electrochemical behavior of Zn and its compounds, and to the study of corrosion of Zn. Diagrams. (P15, R1, Zn)

317-P. Study of the Electrochemical Behavior of an Element Using Electrolysis Curves. (In French.) A. Juliard, C. Rorive-Boute, and D. Bermane. "International Committee on Electrochemical Thermodynamics and Kinetics; Proceedings of the 2nd Meeting" (Libreria Editrice Politecnica Cesare Taburini, Milan, Italy), 1951, p. 69-74; disc., p. 75-76.

Analysis of an electrolysis curve giving variation of intensity of the electrolysis current as a function of difference of voltage applied between an elctrode with a large surface, which is nonpolarizable, and a micro-electrode, dipped in a solution of a given element, making it possible to establish a series of characteristic redox potentials which show electrochemical behavior of the element. With the aid of this technique, electrolysis curves were established from solutions of $Pb(NO_3)_2$, $AgNO_3$, and $FeSO_4$, with different pH's, in the absence or presence of different electrolytes. Includes charts. (P15)

318-P. Considerations on Electrochemical Kinetics. (In French.) R. Piontelli. "International Committee on Electrochemical Thermodynamics and Kinetics; Proceedings of the 2nd Meeting" (Libreria Editrice Politecnica Cesare Taburini, Milan, Italy), 1951, p. 79-104.

The processes of exchange of ions between metals and solutions of their simple salts; also laws which tie current density to electrode voltage. Schematic diagrams. 16 ref. (P15)

319-P. General Outline of Polarization Phenomena of Metals. (In French.) R. Piontelli and G. Poli. "International Committee on Electrochemical Thermodynamics and Kinetics; Proceedings of the 2nd Meeting" (Libreria Editrice Politecnica Cesare Taburini, Milan, Italy), 1951, p. 136-146; disc., p. 147-148.

Apparatus used by the authors and the results obtained, particularly on metals with normal electrochemical behavior. Graphs and schematic diagram. (P15, R1)

320-P. Ionic and Structural Properties and Electrochemical Behavior of Metals. (In French.) R. Piontelli. "International Committee on Electrochemical Thermodynamics and Kinetics; Proceedings of the 2nd Meeting" (Libreria Editrice Politecnica Cesare Taburini, Milan, Italy), 1951, p. 163-184; disc., p. 184.

Aspects of the electrochemical behavior of metals with respect to electrodes exchanging their ions with a solution. Includes table. 32 ref. (P15)

321-P. Influence of the Anion on the Electrochemical Behavior of Metals. (In French.) R. Piontelli. "International Committee on Electrochemical Thermodynamics and Kinetics; Proceedings of the 2nd Meeting" (Libreria Editrice Politecnica Cesare Taburini, Milan, Italy), 1951, p. 185-196; disc., p. 196-197.

Results of a systematic study of the above for both the anode and the cathode. Tabular data. 27 ref. (P15)

322-P. Further Investigations on Evans Cells. (In German.) Kurt Wickert and Hartmut Wiehr. *Werkstoffe und Korrosion,* v. 3, Apr. 1952, p. 129-142.

Presents results of comprehensive investigation of Evans cells (N_2/Fe/-NaCl—Fe/O_2). Effects of mechanical and chemical surface preparation and other factors on cathode deterioration. Numerous other relationships were also investigated. Graphs and tables. (P15, Fe)

323-P. The Influence of Inhibitors Upon Electrochemical Processes on Metallic Surfaces. (In German.) H. Fischer. "International Committee on Electrochemical Thermodynamics and Kinetics; Proceedings of the 2nd Meeting" (Libreria Editrice Politecnica Cesare Taburini, Milan, Italy), 1951, p. 105-115; disc., p. 115.

Inhibition of electrode surfaces, and its various consequences such as polarization, negative catalysis of resulting reactions, reduction and oxidation of inhibitors, and modification of the crystallization process. The specific susceptibility of the metal atoms to inhibitors, and its variation in the submicroscopic realm of the crystals. Tables and graphs. 11 ref. (P15, R10, L17)

324-P. The Influence of Aging Factors on the Emissivity of Reflective Insulations. F. C. Hooper and W. J. Moroz. *ASTM Bulletin,* May 1952, p. 92-95.

Includes foreword by E. A. Allcut and a study of the above on metal foil subjected to such conditions as atmospheric exposure and spraying with dilute chemical solutions. Tables and graph. (P17)

325-P. Thermal Conductivity Coefficients; New French Method of Determination in Metals. *Chemical Age,* v. 66, May 3, 1952, p. 695-696. (From paper by Edmond Rousseau, *Chimie et Industrie,* v. 67, no. 2, 1952, p. 242-248.)

Includes apparatus diagram for new calorimetric procedure. (P11)

326-P. Dynamic Hysteresis Loop Measuring Equipment. H. W. Lord. *Electrical Engineering,* v. 71, June 1952, p. 518-521.

Test circuit for magnetic materials. Sources of error and means of compensating for them in the hysteresis loop displayed on the oscilloscope of the test unit. Block diagram and oscillograms. (P16)

327-P. The Magnetic Structure of Alnico 5. E. A. Nesbitt and R. D. Heidenreich. *Electrical Engineering,* v. 71, June 1952, p. 530-534.

The mechanism which enables the alloy to respond to heat treatment in a magnetic field. (This treatment produces a 3-fold increase in the figure of merit.) Experimental work was guided by theory of Kittel, Nesbitt, and Shockley. Graphs and electron micrographs. 11 ref. (P16, Fe, SG-n)

328-P. Magnetic Core Materials for Small Power Transformers. Arthur V. Hughes and Charles F. Salt. *Electrical Manufacturing,* v. 49, June 1952, p. 133-138, 324, 326, 328, 330, 332, 334, 336.

A study of various materials and configurations in relation to optimum transformer design. Effects of lamination thickness, joints, core clamps, temperatures, and frequency of operation on performance. Tables and graphs. (P16, SG)

329-P. Activity of Sulphur in Liquid Iron and Steel. Charles W. Sherman and John Chipman. *Journal of Metals,* v. 4, June, 1952: *Transactions of American Institute of Mining and Metallurgical Engineers,* v. 194, 1952, p. 597-602.

The chemical behavior of sulfur in liquid iron at 1600° C. was investigated through study of the equilibrium of the reaction: $H_2 + S = H_2S$. From the known equilibrium constant of the reaction and the experiment data, activity of sulfur in the melt was determined. Effects on activity coefficient of P, C, Al, Si, Cu, and Mn were determined. A semi-empirical method was devised for calculating activity coefficient of sulfur in complex solutions of four or more components and tested against extensive data on solutions of this kind. 12 ref. (P12, Fe, ST)

330-P. Solid Solubility of Sulphur in Iron. Terkel Rosenqvist and Boleslaw L. Dunicz. *Journal of Metals,* v. 4, June, 1952: *Transactions of American Institute of Mining and Metallurgical Engineers,* v. 194, 1952, p. 604-608.

The work was based on measurement of chemical activity of sulfur in the solid solution by means of equilibrium with a mixture of H_2 and H_2S. When the solid-solubility limit is reached, the S activity in the Fe becomes equal to that in the co-existing sulfide phase. Apparatus and procedure. Data are charted

and tabulated. Phase diagram for the low-S region of the Fe-S system. 10 ref. (P12, Fe)

331-P. Melting Point and Transformation of Pure Chromium. D. S. Bloom. J. W. Putman, and N. J. Grant. *Journal of Metals,* v. 4, June, 1952: *Transactions of American Institute of Mining and Metallurgical Engineers,* v. 194, 1952, p. 626.

Because of wide variations in recent melting-point determinations, a new study was made using very pure Cr. Result of 1903° C. for melting point is believed to be accurate to ±10° C. Temperatures of the $\alpha \rightarrow \beta$ and reverse transformations were also determined. (P12, Cr)

332-P. Optical Temperature Scale and Emissivities of Liquid Iron-Copper-Nickel Alloys. David B. Smith and John Chipman. *Journal of Metals,* v. 4, June, 1952: *Transactions of American Institute of Mining and Metallurgical Engineers,* v. 194, 1952, p. 643-644.

Range of measurements on Cu-free metals was extended from the melting point to 1600° C. For Cu, the upper limit was 1380° C, and the data were extrapolated linearly for comparison with observations on the other metals and alloys at 1535° C. (P17, Fe, Cu, Ni)

333-P. Thermal Expansion of Aluminum and Some Aluminum Alloys. Peter Hidnert and H. S. Krider. *Journal of Research of the National Bureau of Standards,* v. 48, Mar. 1952, p. 209-220.

A study of thermal expansion for various temperature ranges between −50 and +400° C. by the fused-quartz tube and dial-indicator, and by precision micrometric methods. Ternary diagrams are given for effects of composition on expansion of Al-Cu-Ni and Al-Si-Cu alloys. Tables and graphs. 16 ref. (P11, Al)

334-P. Temperature Variation of the Magnetostriction of "Alcomax". M. McCaig. *Nature,* v. 169, May 24, 1952, p. 889-890.

Graph for preliminary results on Alcomax and some related alloys in reference to magnetic anisotropy. (P16)

335-P. Thermal Conductivity in the Intermediate State of Pure Superconductors. D. P. Detwiler and Henry A. Fairbank. *Physical Review,* ser. 2, v. 86, May 15, 1952, p. 574.

Measurements of thermal conductivity of Johnson-Matthey spectroscopically pure Sn and In as a function of transverse magnetic field strength suggest that the thermal-conductivity minimum and hysteresis effects in the intermediate state may be characteristic of all pure superconductors. (P11, P16, Sn, In)

336-P. Discontinuities in the Variation of Magnetization With Temperature. V. L. Newhouse. *Proceedings of the Physical Society,* v. 65, sec. A, May 1, 1952, p. 325-328.

Demonstrates that magnetic discontinuities accompany changes of temperature at constant field. The effect was investigated for hard drawn Fe and Ni and is accounted for in terms of two mechanisms, one associated with decrease of coercivity with rise of temperature and the other with disperse field due to thermal oscillations of the carriers of magnetic moment (P16, Fe, Ni)

337-P. Method for the Determination of Hysteresis Loop Area. W. B. Conover. *Transactions of the American Institute of Electrical Engineers,* v. 70, pt. 2, 1951, p. 1485-1486.

Method is somewhat less accurate than conventional methods, but more rapid and convenient, and requires no special equipment. It can be applied directly to loops on the screen of a cathode-ray oscilloscope without photography or manual tracing. Illustrated by a typical hysteresis loop for magnetic sheet steel. (P16)

338-P. Adsorption and the Hydrogen Overpotential. P. J. Hillson. *Transactions of the Faraday Society,* v. 48, May 1952, p. 462-473.

Hydrogen overpotential and capacity of the working electrode were measured on electrodes of Hg, Ni, W, Ta, Au, and Ag in the presence of n-hexyl alcohol, n-caproic acid, n-hexylamine hydrochloride and p-toluene sulfonic acid. Differential effects of these capillary-active substances. Calculates hydrogen overpotential of various metals from literature data. Apparatus diagram, tables, and graphs. 17 ref. (P15, Hg, Ni, W, Ta, Au, Ag)

339-P. Electrical Conductivity of Thin Platinum Coatings on Dielectric Bases, Deposited in Vacuum. (In French.) Charles Feldman. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences,* v. 234, May 5, 1952, p. 1858-1860.

The conductivity of platinum deposits on KBr, CaF_2, and SiO_2 was investigated. Differences in their conductivity, and interpretation of the results. (P15, Pt)

340-P. Study of a Ferronickel at a Very Low Voltage in Static and Alternating Fields. (In French.) Israel Epelboin and Guy Gilardin. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences,* v. 234, May 5, 1952, p. 1860-1862.

Two methods for the study of magnetization in static and alternating fields, applied to test pieces of closed magnetic current, for the purpose of comparing mumetal strips of high permeability. Proposes an explanation of the magnetic properties. (P16, Fe, Ni, SG-n, p)

341-P. Capture of Negative μ Mesons in Copper and Tin. (In French.) André Lagarrigue and Charles Peyrou. *Comptes Rendus hebdomadaires des séances de l'Académie des Sciences,* v. 234, May 5, 1952, p. 1873-1875.

The probability of electron emission by the negative μ mesons caught by Cu and Sn lattices. The study was in a Wilson chamber with a magnetic field. Results are interpreted. (P10, Cu, Sn)

342-P. Measuring Cathodic Oxygen Reduction by Means of Suitable Model Elements. (In German.) F. Tödt. *Zeitschrift für Elektrochemie; Berichte der Bunsengesellschaft für physikalische Chemie,* v. 56, Mar. 1952, p. 165-169.

Reduction of oxides on Au as well as on Pt can be studied by measuring capacitance and galvanic current generated by action of oxygen, even though the layer be less than mono-atomic in average thickness. Tables and graphs. 11 ref. (P15)

343-P. Polarization Capacitance, Adsorption, and Overvoltage of Hydrogen on Platinum. (In German.) E. Wicke and B. Weblus. *Zeitschrift für Elektrochemie; Berichte der Bunsengesellschaft für physikalische Chemie,* v. 56, Mar. 1952, p. 169-176.

Mechanism of hydrogen exchange between electrode and electrolyte and of hydrogen overvoltage depends mainly on degree of coating of electrode with adsorbed hydrogen. Effect of electrolyte composition on polarization capacitance and, thus, hydrogen adsorption was investigated, results indicating that overvoltage is a result of slow discharge of hydrogen ions at the surface of the Pt electrode. Data are charted. (P15, Pt)

344-P. Activities in the Molten Ternary Na-Pb-Hg System. (In German.) F. Halla and R. Herdy. *Zeitschrift für Elektrochemie; Berichte der Bunsengesellschaft für physikalische Chemie,* v. 56, Mar. 1952, p. 213-218.

Measurements of emf.'s and of vapor pressures were made to determine reactivities, heats of mixing, and affinities. Graphs and tables. (P12, Na, Pb, H)

345-P. Internal Friction of Molten Silver-Copper-Gold Alloys. (In German.) Erich Gebhardt and Georg Wörwag. *Zeitschrift für Metallkunde,* v. 43, Apr. 1952, p. 106-108.

Results of internal friction measurement show that viscosity of these ternary alloys increases with declining temperature and increasing Au content. Tables and graphs. (P10, Q22, Ag, Cu, Au)

346-P. Mechanism of "Explosion" of Wires. (In German.) Bruno Eiselt. *Zeitschrift für Physik,* v. 132, No. 1, 1952, p. 54-71.

When a highly charged condenser is discharged through a thin wire, the wire often vaporizes suddenly in a manner resembling an explosion. This phenomenon was investigated, using optical, motion-picture, electrical, and oscillographic techniques. Methods and equipment; typical results on Cu and Fe wires. 18 ref. (P15, Cu, Fe)

347-P. Influence of Carbon on Interfacial Tension of Iron at the Slag-Metal Boundary. (In Russian.) S. I. Popel, O. A. Esin, and Iu. P. Nikitin. *Doklady Akademii Nauk SSSR,* new ser., v. 83, Mar. 11, 1952, p. 253-255.

A study was made of the surface tension of molten Fe when exposed to slag instead of gaseous media. Data are charted. (P10, Fe)

348-P. The Atomistic Theory of Metallic Surfaces. Conyers Herring. *American Society for Metals,* "Metal Interfaces", 1952, p. 1-19; disc., p. 19.

A qualitative exposition. Diagrams. 12 ref. (P10)

349-P. Theory of Internal Boundaries. Harvey Brooks. *American Society for Metals,* "Metal Interfaces", 1952, p. 20-64; disc., p. 64.

Concerned mainly with interfaces between crystalline solids. Types of internal boundaries; requirements for a theory of internal boundaries; general properties of internal surfaces; models of grain boundaries; and interphase boundaries. Includes mathematical appendices. 40 ref. (P10, M27)

350-P. Measurement of Solid:Gas and Solid: Liquid Interfacial Energies. Harry Udin. *American Society for Metals,* "Metal Interfaces", 1952, p. 114-133.

Surveys recent work (since 1945), at least four groups of workers. Typical results are charted and discussed. 26 ref. (P10)

351-P. Measurement of Solid: Solid Interfacial Energies. James B. Hess. *American Society for Metals,* "Metal Interfaces", 1952, p. 134-150; disc., p. 150-152.

Basic concepts and various measurement procedures. The best scheme at the present time is said to be the one of microscopically measuring the dihedral angles between intersecting interfaces at equilibrium. 37 ref. (P10)

352-P. Energies and Structure of Grain Boundaries. K. T. Aust and B. Chalmers. *American Society for Metals,* "Metal Interfaces", 1952, p. 153-178.

The two theories which attempted to explain the structure of the grain boundary, namely the amorphous cement and the transitional-lattice theories, are considered in the light of experimental evidence. Properties of grain boundaries, such as melting, mechanical and viscous behavior, and chemical effects, indicate the transitional-lattice theory to be the more suitable one. Recent

measurements of an intrinsic property of the boundary, namely its surface free energy, have shown that the boundary energies for Sn, Pb, silicon ferrite, and Ag are dependent upon difference of orientation of the grains on either side of the boundary. This is regarded as incontrovertible evidence that different boundaries differ in structure and cannot, therefore, be amorphous. Other theories and experimental approaches. 85 ref. (P10, M27)

353-P. Stress Relaxation Across Interfaces. A. S. Nowick. *American Society for Metals,* "Metal Interfaces", 1952, p. 248-268.

Studied by application of torsional stresses to wires a wide variety of anelastic phenomena that occur in materials containing internal interfaces may be explained by the simple assumption that an interface is unable to maintain permanently a shearing stress across it. The detailed behavior of a material depends on how the interfaces within it are distributed. Both Kes and Mott's theories of activation energy for interface relaxation seem to be inconsistent with new data presented. A tentative mechanism consistent with present experimental data, is that relaxation occurs by transfer of atoms from one edge dislocation to another. 28 ref. (P10, Q22)

354-P. Mechanical Effects of Interfaces. Bruce Chalmers. *American Society for Metals,* "Metal Interfaces", 1952, p. 299-311.

The various types of interfaces occurring in and around metals: external, and intracrystalline between the same and differing phases. Their effects on mechanical properties. 33 ref. (P10, Q general)

355-P. Metal Surface Phenomena. Herbert H. Uhlig. *American Society for Metals,* "Metal Interfaces", 1952, p. 312-335.

A fundamental discussion of physical and chemical forces acting at the surface of metals. Adsorption on metals; physical adsorption and chemisorption; chemisorption of oxygen on tungsten; passivity; adsorption and lubrication; adsorption of metals on metals; and factors affecting chemisorption. Diagrams and graphs show illustrative data for various metals. 38 ref. (P10, P13)

356-P. Eddy-Currents in Solid Cylindrical Cores Having Non-Uniform Permeability. Harold Aspden. *Journal of Applied Physics,* v. 23, May 1952, p. 523-528.

Mathematical presentation of a method of estimating magnetization losses due to eddy currents in solid cylindrical cores of ferromagnetic material. The conception of complex permeability is introduced to show the effects which hysteresis has upon degree of flux penetration. (P16, Fe)

357-P. Magnetically Induced Ultrasonic Velocity Changes in Polycrystalline Nickel. S. J. Johnson and T. F. Rogers. *Journal of Applied Physics,* v. 23, May 1952, p. 574-577.

Shear and compressional ultrasonic propagation modes are used throughout the range of 1-10 mc. The polycrystalline measurements are compared to recently published single Ni crystal values. 16 ref. (P10, Ni)

358-P. Heat Conduction in Alloys at Low Temperatures. I. Estermann and J. E. Zimmerman. *Journal of Applied Physics,* v. 23, May 1952, p. 578-588.

Method by which the thermal conductivity of relatively small samples ($\frac{1}{8}$-$\frac{1}{4}$ in. diameter, 1-2 in. long) of various materials can be measured in the temperature regions obtainable with liquid N_2, H_2, and He. Preliminary measurements on several commercial alloys (Monel, Inconel, and stainless steel) were made. Tables and graphs. 16 ref. (P11, Ni, SS)

359-P. Electrodeposition Behavior of a Simple Ion. II. Precipitation Into a Liquid Electrode (Mercury). L. B. Rogers. *Journal of the Electrochemical Society,* v. 99, June 1952, p. 267-271.

Distribution of a trace of an element between an aqueous solution of its salt and a mercury cathode is considered to be a special example of solvent extraction in which distribution is a function not only of the volume of the liquids but also of the cathode potential. Method of improving separations by adjusting the ratio of the volumes of mercury and aqueous solution before electrolysis. 14 ref. (P15)

360-P. Electro-Organic Chemistry. H. Jermain Creighton. *Journal of the Electrochemical Society,* v. 99, June 1952, p. 127C-130C.

Historical review of progress. Various classic investigations; also means for extending scope of this field. 46 ref. (P15, A2)

361-P. Effect of the Blocking Layer on the Tarnishing Process at the Metal-Selenium Boundary. (In German.) Siegfried Poganski. *Zeitschrift für Elektrochemie; Berichte der Bunsengesellschaft für physikalische Chemie,* v. 45, Mar. 1952, p. 193-198.

Cd and Se in close contact, which have a marked blocking effect, were used to investigate the expected effect of the blocking layer at the boundary between a metal and certain metalloids on the rate of tarnishing of this layer at different temperatures. Diagrams and graphs. 14 ref. (P15, R2, Cd, Se)

362-P. (Book) **Metal Interfaces.** 348 pages. 1952. American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio. $5.00.

A series of papers presented at 33rd National Metal Congress and Exposition, Detroit, Oct. 13-19, 1951. Individual papers are separately abstracted. (P10, N general)

363-P. (Book) **Modern Magnetism.** Ed. 3. L. F. Bates. 506 pages. 1951. Cambridge University Press, London, England.

Attempts to explain modern magnetic theory not only for students of physics, but for more general readers. Accounts of experimental work, particularly foreign, are included; not only for their contribution to magnetic theory, but for their importance in industrial applications. Includes information on specific metallic and nonmetallic magnetic materials. Footnote references. (P16)

364-P. (Book) **Comite International de Thermodynamizue et de Cinetique Electrochimiques.** (International Committee on Electrochemical Thermodynamics and Kinetics.) Proceedings of the 2nd meeting, 1950, 407 pages. 1951. Libreria Editrice Politecnica Cesare Tamburini, Milan, Italy.

Papers and discussions given at above meeting. Electrochemical equilibria, electrochemical kinetics, application to the study of corrosion, application to the study of general chemistry and analytical chemistry, polarography, and electrochemical nomenclature and definitions. Selected papers are abstracted separately. (P15, P13, R1, L17, S11)

365-P. (Book) **Nagrev Metalla; Teoriia i Metody Rascheta.** (Heating of Metals; Theory and Methods of Calculation.) G. P. Ivantsov. 191 pages. 1948. Government Scientific-Technical Publishing House for Literature on Ferrous and Nonferrous Metallurgy, Sverdlovsk and Moscow, U.S.S.R.

Mathematical bases of the theory of heating metals in furnaces under different conditions of heat exchange. Original and classical methods for calculating time of heating. Formulas, tables, and graphs; numerical examples. (P12)

Q

MECHANICAL PROPERTIES AND TEST METHODS; DEFORMATION

496-Q. Uses of Titanium in Turbojets. H. H. Hanink. *Automotive Industries,* v. 106, May 15, 1952, p. 90, 92, 96. (A condensation.)

Refers to components common to all engine types, since security regulations do not permit discussion of the internal parts of any particular engine. Comparative mechanical properties of potential compressor-disk materials vs. temperature are charted. (Q general, T25, Ti, SG-h)

497-Q. Rosslyn Metal Undergoes High Temperature Tests. *Automotive Industries,* v. 106, May 15, 1952, p. 102, 105-106.

Rosslyn Metal, a development of American Cladmetals Co., is a composite copper-stainless steel sheet material said to have the high thermal conductivity. Its use in jet-engine parts is being evaluated by Ryan Aeronautical Co. (Q general, P11, T24, Cu, SS, SG-h)

498-Q. The Harmful Influence of Some Residual Elements in Magnesium-Treated Nodular Cast Irons and Their Neutralization By Cerium. H. Morrogh. *British Cast Iron Research Association Journal of Research and Development,* v. 4, Apr. 1952, p. 292-314.

The harmful effects of Ti, Pb, Sb, Bi, Al, and Cu in Mg-treated nodular cast irons. Influence of Sn and As. Tabular data. 12 pages of photomicrographs. (Q general, M27, CI)

499-Q. Absolute Hardness Scale. J. Murkes. *Engineers' Digest,* v. 13, Apr. 1952, p. 112-114. (Translated and condensed from *Teknisk Tidskrift,* v. 82, Jan. 15, 1952, p. 37-40.)

Critically considers known methods of hardness determination, in particular that of Chrustiov and its applicability. Graphs and tables. (Q29)

500-Q. Rare Earths Boost Creep Resistance of Mg-Zr Alloys. W. G. Patton. *Iron Age,* v. 169, May 22, 1952, p. 134-136.

By adding 2-4% rare earths to Mg-Zr alloys, Dow Chemical has produced new alloys with outstanding high-temperature properties. (Q3, Mg)

501-Q. The Dynamic Theory of Yield. K. E. Puttick and M. W. Thring. *Iron & Steel,* v. 25, May 1952, p. 155-159.

Reviews theories proposed. Recent work on tensile and compressive impact tests, brittle fracture, and the onset of twinning, in light of the theory. Graphs. 25 ref. (Q23)

502-Q. Internal Friction; Influence of Carbon and Nitrogen in Iron and Steel. J. D. Fast and L. J. Dijkstra. *Iron & Steel,* v. 25, May 1952, p. 165-169, 188.

Previously abstracted under similar title, from *Philips Technical Review.* See item 274-Q, 1952. (Q22, Q8, N7, Fe, ST)

503-Q. Some Current Views on the Mechanism of Creep. L. M. T. Hopkin. *Journal of the Birmingham Metallurgical Society,* v. 32, Mar. 1952, p. 15-33.

A critical survey illustrated by

graphs and micrographs taken from the literature. 34 ref. (Q3)

504-Q. Repeated Load Tests on Welded and Prestrained Steels. Sadun S. Tör, Jan M. Ruzek, and Robert D. Stout. *Welding Journal,* v. 31, May 1952, p. 238s-246s.

Development of test specimens and procedure and of test equipment. Repeated-load machine includes SR-4 strain gages for calibration of strains. Al-killed A-201 and rimmed A-285 steel plates ⅝ in. thick were tested after various heat treating, bead welding, or tensile straining pretreatments, at room temperature and at 500° F. Origin of cracking. Micrographs, diagrams, illustrations, and graphs.
(Q27, K general, CN)

505-Q. The Effect of Quench-Aging on the Notch Sensitivity of Steel. J. R. Low, Jr. *Welding Journal,* v. 31, May 1952, p. 253s-256s.

Charpy impact-test specimens of a semikilled 1020 steel were quenched from 690° C. and aged at room temperature for periods to three years. Transition temperature changes were followed. Suggests that quench-aging is responsible for the usual brittle zone adjacent to welds in 1020 steel and that a low-temperature post-heat treatment similar to that used for overaging should improve the low-temperature ductility of welded structures made of this and similar grades of steel. Graphs.
(Q23, J27, CN)

506-Q. Dimensional Effects in Fracture. *Welding Journal,* v. 31, May 1952, p. 271s-272s.

Discussion by Wendell P. Roop of above paper by C. W. MacGregor and N. Grossman, (Jan. 1951 issue; item 166-Q, 1952.) Includes author's reply. (Q26, TS)

507-Q. High-Temperature Materials: Tests Used as Criteria of Service Behaviour. (In English.) L. B. Pfeil. *Schweizer Archiv für angewandte Wissenschaft und Technik,* v. 18, Mar. 1952, p. 88-97.

Discussion based on critical evaluation of the literature and the author's experiences. Creep resistance, fatigue strength, corrosion resistance, and thermal shock resistance, said to be the most important properties for high-temperature service. Emphasis is on behavior of Nimonic 80, a high-Ni alloy. 25 ref.
(Q general, R general, Ni)

508-Q. Copper and Copper Alloys. 7. Nickel-Alloyed Aluminum Bronzes. (In Dutch.) W. G. R. De Jager. *Metalen,* v. 7, Mar. 15, 1952, p. 88-89; Apr. 15, 1952, p. 128-129.

Mechanical properties of Al bronzes alloyed with 0-5.5% Ni are discussed, charted, and tabulated.
(Q general, Cu)

509-Q. The Structure of Metals After Plastic Deformation. (In French.) Paul Bastien. *Metaux: Corrosion—Industries,* v. 27, Mar. 1952, p. 95-106.

Investigated from the macrographic, micrographic, and crystalline aspect. Influence of cold and hot working on mechanical characteristics of ferrous and nonferrous metals. Micrographs, tables, and diagrams. 14 ref.
(Q24, M26, M27, M28)

510-Q. Creep of Metals and Methods for Its Measurement. (In French.) E. Morlet. *Metaux: Corrosion—Industries,* v. 27, Mar. 1952, p. 107-118.

The different types of deformations of metal bars subjected to traction; deformations of metals and alloys as a function of weather and temperature; and influence of various factors on resistance to creep. Includes diagrams and charts. 17 ref. (Q3)

511-Q. Research on the Exhaust Valves of Airplane Engines. (In French.) E. H. Bucknall and F. A. Ball. *Revue de Métallurgie,* Apr. 1952, p. 249-261; disc., p. 261.

Research during the war at Mond Nickel Co., England, on the improvement of materials and methods of production of airplane exhaust valves. Micrographs show crack formation and microstructure under various circumstances and in different materials, especially 80-20 Ni-Cr alloys and an alloy steel containing 0.35-0.50% C, 1.0-2.5% Si, 1.50% Mn max., 10% Ni min., 12.0-16% Cr, and 2.0-4.0% W. An alloy of 74% Ni, 20% Cr, and 6% Fe was also studied, as well as effects of 1% Cb on it. Mechanical properties (shock resistance and hardness) were studied. Data are tabulated.
(Q general, M27, SS, Ni)

512-Q. Contribution to the Study of the Wear of Cutting Tools. (In French.) F. Eugene. *Revue de Métallurgie,* Apr. 1952, p. 267-282; disc., p. 282.

Various factors were investigated, particularly the influence of sharpening angle and of cutting rate. Method for measuring the wear resistance of cutting tools. Results obtained with various toolsteels. Micrographs, tables, and diagrams.
(Q9, G17, SG-j, TS)

513-Q. Tin and Arsenic in Annealed Alloy Structural Steels. (In German.) H. Krainer and W. Daum. *Berg- und Hüttenmännische Monatshefte der Montanistischen Hochschule in Leoben,* v. 97, Apr. 1952, p. 67-72.

Effects of Sn contents up to 0.4% and of As contents up to 0.5% on hardness and notch-impact toughness of 15 different steels under different heat treating and quenching conditions. Results show that As and Sn have undesirable effects. Photographs, tables, and graphs. 14 ref. (Q29, Q6, AY)

514-Q. An Impact-Notch Notch-Impact Sample. (In German.) R. Mitsche. *Berg- und Hüttenmännische Monatshefte der Montanistischen Hochschule in Leoben,* v. 97, Apr. 1952, p. 72-73.

A specimen for testing tendency to brittle fracture made by forming the notch by impact with a special device on the Charpy hammer. (Q6)

515-Q. Influence of Mechanical Polishing and Electropolishing on the Micro and Macrohardness of Metals. (In German.) Th. Geiger. *Schweizer Archiv für angewandte Wissenschaft und Technik,* v. 18, Feb. 1952, p. 41-46.

Experiments applied to 18-8 austenitic steel, electrolytic iron, and carbon steel. The tests show that both mechanical and electrolytic polishing result in considerable surface hardening, particularly of austenitic steels. Micrographs and radiographs confirm results of the hardness tests. Graphs and tables.
(Q29, L10, L13, Fe, CN, SS)

516-Q. Creep-Stress Tests on Malleable Anticorodal B, Age-Hardened Avional-23, and Soft Peraluman at 26, 100, and 130° C. (In German.) E. von Burg. *Schweizer Archiv für angewandte Wissenschaft und Technik,* v. 18, Mar. 1952, p. 73-86.

Includes investigation of creep-stress behavior of notched bars. Shows that creep strength of light metals is greatly affected by production conditions, so that same producer may deliver at different times, a given light metal with different creep resistances. Graphs and tables. (Q3, Al)

517-Q. Comparative Representation of the Properties of Cemented Carbide Alloy. (In German.) Carl Ballhausen. *Stahl und Eisen,* v. 72, Apr. 24, 1952, p. 489-492.

Graphical representation from which a standard designation system for the carbide alloys is developed. Mechanical and physical properties are tabulated.
(Q general, P general, C-n)

518-Q. Banding of Steel. (In Swedish.) S. Baeckstrom. *Jernkontorets Annaler,* v. 136, No. 1, 1952, p. 9-20.

Reviews the above on the basis of the literature, in particular the causes of band structure, and some factors which influence formation of banding, lamination, and similar structures. 39 ref. (Q24, ST)

519-Q. New Techniques For Measuring Forces and Wear in Telephone Switching Apparatus. Warren P. Mason and Samuel D. White. *Bell System Technical Journal,* v. 31, May 1952, p. 469-503.

Several new techniques devised for producing and controlling normal and tangential motions for wear studies. The forces are measured by inserting small barium titanate ceramics between points of application of the forces and observing the voltages generated on a cathode-ray oscillograph. Quantitative measurements of wear were made for a variety of materials, and it was shown that materials with a large elastic strain limit wear (plastics and rubber) better than materials with a small elastic strain limit (metals or glass) even though the latter have a higher yield stress. Brass and stainless steel were the metals studied. Graphs, diagrams, tables, and illustrations. 16 ref.
(Q9, Cu, SS)

520-Q. Principal Strains in Cable Sheaths and Other Buckled Surfaces. I. L. Hopkins. *Bell System Technical Journal,* v. 31, May 1952, p. 523-529.

Equations are developed for rigorous determination of magnitudes and directions of principal strains in plastic deformation, by means of measurements of rectangular strain rosettes. Application to study of telephone-cable sheath. (Q25)

521-Q. The Bending and Twisting of Anisotropic Plates. R. F. S. Hearmon and E. H. Adams. *British Journal of Applied Physics,* v. 3, May 1952, p. 150-156.

The theory of the deflection of anisotropic plates under bending and twisting loads. Experimental methods for investigating the theory were tested on Al, brass, and mild-steel plates. The results of experiments on plywood cut at various angles to the grain are found to conform with the theory. Apparatus, diagrams and tables.
(Q5, Q1, Al, Cu, CN)

522-Q. Low-Stress Torsional Creep Properties of Pure Aluminium. W. Betteridge. *Bulletin of the Institute of Metals,* May 1952, p. 76-77. (Bound with *Journal of the Institute of Metals,* v. 80, 1952.)

A study in reference to effects of cold work and annealing on creep behavior. Torsion-creep curves were determined on super-purity Al using ¼-in. diameter test rods at constant stress at 200° C. Additional tests were made on single crystals. Graph and table. (Q3, Al)

523-Q. The Flow of Metals. E. N. da C. Andrade. *Engineer,* v. 193, May 16, 1952, p. 658-659; May 23, 1952, p. 692-693.

Sixth Hatfield Memorial Lecture reviews knowledge about creep of metals under stress. Creep behavior of Pb, Sn, Cu, Fe, Cd, solid Hg and many other materials is very similar if allowance is made for temperature, and can be expressed by a simple equation. The physical mechanism of creep. 18 ref.
(Q3, Pb, Sn, Cu, Fe, Cd, Hg)

524-Q. War on Wear. H. Blok. *Engineering*, v. 173, May 9, 1952, p. 594; May 16, 1952, p. 625-626.

A general discussion of fundamental principles, types of wear, and means of combating it. (Q9)

525-Q. The Size Effect in Fatigue of Plain and Notched Steel Specimens Loaded Under Reversed Direct Stress. C. E. Phillips and R. B. Heywood. *Institution of Mechanical Engineers, Proceedings* (Applied Mechanics Div.), v. 176, W. E. P. 65, 1951, p. 113-124; disc., p. 130-140.

Fatigue strength was determined for specimens of various diameters in the range of 0.19-2.4 in. for a 25-ton mild steel and a 65-ton, 2½% Ni-Cr steel. No intrinsic size effect was observed with plain specimens, but size effects were found for notched specimens. Graphs, tables, photographs, and micrographs. (Q7, CN, AY)

526-Q. Some Fatigue Tests on Aluminium-Alloy and Mild-Steel Sheet, With and Without Drilled Holes. C. E. Phillips and A. J. Fenner. *Institution of Mechanical Engineers, Proceedings* (Applied Mechanics Div.), v. 165, W. E. P. 65, 1951, p. 125-129; disc., p. 130-140.

Tests under pulsating direct stress of panels approximately 0.1 in. thick and up to 12 in. maximum width. Size effects occur for both panel and hole size. Tables, diagrams, graphs, and photographs. (Q7, Al, CN)

527-Q. Cold Working; Softening of Overstrained Metals. N. H. Polakowski. *Iron & Steel*, v. 25, May 17, 1952, p. 225-228; disc., p. 251-256.

Previously abstracted under similar title from *Journal of the Iron and Steel Institute*, item 154-Q, 1952. (Q24, N5, Cu, Ni, Al, ST)

528-Q. Low-Alloy Steels; Effect of Hydrogen on Their Properties. J. D. Hobson and C. Sykes. *Iron & Steel*, v. 25, May 17, 1952, p. 246-251; disc., p. 261-264.

Previously abstracted under similar title from *Journal of the Iron and Steel Institute*, item 67-Q, 1952. (Q23, AY)

529-Q. A Study of Some Factors Influencing the Young's Modulus of Solid Solutions. A. D. N. Smith. *Journal of the Institute of Metals*, v. 80, May 1952, p. 477-482.

Values for a series of binary solid solutions of Cu with Zn, Ga, Ge, Si, and As, and of Ag with Cd, In, and Sn were measured dynamically at room temperature. In agreement with earlier work, it was found that, in any one system, the modulus decreases approximately linearly with atomic percentage of the solute, although rate of decrease differs for each system. This rate of decrease depends not only on difference in atomic radii of the solute and solvent, but also on difference in valency between the two constituents. 17 ref. (Q21)

530-Q. Residual Stresses in Chill-Cast and Continuously Cast Aluminium Alloy Billets. R. A. Dodd. *Journal of the Institute of Metals*, v. 80, May 1952, p. 493-500.

Effect of the following variables on the magnitude of internal stresses in chill-cast Al-alloy billets was studied: length of billet, diameter of billet, pouring temperature, and rate of flow of cooling water. Stresses were determined mechanically by Sach's boring method and shown to be independent of billet dimensions and of rate of flow of cooling water, but to increase approximately linearly with increase in pouring temperature. Effect of pouring temperature and rate of pouring on residual stresses in semicontinuously cast billets was also studied. Graph and tables. (Q25, Al)

531-Q. Creep Processes in Coarse-Grained Aluminium. D. McLean. *Journal of the Institute of Metals*, v. 80, May 1952, p. 507-519.

A specimen of super-pure Al was extended under a constant load of ½ ton per sq. in. at 200° C. to fracture, which occurred at 65% extension in 850 hr. Observations were made of slip-band and grain-boundary movements which were measured, mainly by means of an interference microscope, and their respective contributions to the creep extension calculated. Tables and photomicrographs. 23 ref. (Q3, Q24, Al)

532-Q. Electron-Microscopic Studies of Slip in Aluminium During Creep. J. Trotter. *Journal of the Institute of Metals*, v. 80, May 1952, p. 521-523.

Slow deformation of a specimen of 99.98% Al at 200° C. was studied by means of the electron microscope, using the plastic-replica process. Shows that slip zones do not consist of bundles of long parallel slip lamellae of the type found by Heidenreich and Shockley in room-temperature deformation, but of intimate segments of primary and cross-slip. Electron micrographs. 10 ref. (Q3, Q24, Al)

533-Q. Compression Texture of Iodide Titanium. D. N. Williams and D. S. Eppelsheimer. *Journal of Metals*, v. 4, June, 1952: *Transactions of American Institute of Mining and Metallurgical Engineers*, v. 194, 1952, p. 615-618.

Found to consist of a (0001) texture rotated 15-30° from the axis of compression. As the amount of reduction increases, the angle of rotation decreases. (Q24, Ti)

534-Q. Observations of Creep of the Grain Boundary in High Purity Aluminum. H. C. Chang and N. J. Grant. *Journal of Metals*, v. 4, June, 1952: *Transactions of American Institute of Mining and Metallurgical Engineers*, v. 194, 1952, p. 619-625.

Experimental observations of behavior of the grain boundaries and their effect on deformation in the grains. High-purity Al was used to avoid complications. Micrographs. 16 ref. (Q3, Al)

535-Q. Effect of Zirconium on Magnesium-Thorium and Magnesium-Thorium-Cerium Alloys. T. E. Leontis. *Journal of Metals*, v. 4, June, 1952: *Transactions of American Institute of Mining and Metallurgical Engineers*, v. 194, 1952, p. 633-642.

Addition of Zr to sand-cast Mg-Th alloys effects a marked decrease in grain size which is accompanied by a significant increase in mechanical properties over the entire range of Th content investigated. The beneficial effect is maintained at temperatures up to 700° F. In addition, the alloys exhibit exceptionally high creep resistance up to 600° F. Ce was found to be a desirable addition to Mg-Th-Zr alloys. Extensive tables, graphs, and micrographs. 13 ref. (Q general, M27, Mg)

536-Q. Effect of Prior Strain at Low Temperatures on the Properties of Some Close-Packed Metals at Room Temperature. W. C. Ellis and E. S. Greiner. *Journal of Metals*, v. 4, June, 1952; *Transactions of American Institute of Mining and Metallurgical Engineers*, v. 194, 1952, p. 648-650.

As temperature of deformation is lowered, flow strength and ultimate strength of a number of metals and alloys at room temperature are increased. Likewise, in materials in which lattice scattering predominates, electrical conductivity is decreased to a greater degree as temperature of deformation is lowered. Data for a number of commercial metals and alloys rolled at −195° C. illustrate the increase in strength properties that may be obtained by such treatment. (Q24, P15)

537-Q. Deformation of Zinc Bicrystals by Thermal Ratcheting. J. E. Burke and Anna M. Turkalo. *Journal of Metals*, v. 4, June, 1952; *Transactions of American Institute of Mining and Metallurgical Engineers*, v. 194, 1952, p. 651-656.

Phenomenon of "thermal fatigue" proposed by Boas and Honeycombe. The possibility was investigated that an additional mechanism might cause plastic deformation during thermal cycling—a "thermal ratchet" that depends upon a combination of grain-boundary flow to relax the stress that develops between differently oriented grains upon raising the temperature, and transcrystalline slip to relax the oppositely directed stress which develops on lowering the temperature. Theoretical analysis is followed by details of experiments on Zn bicrystals. (Q24, Zn)

538-Q. Influence of Nitrogen on the Notch Toughness of Heat-Treated 0.3-Percent-Carbon Steels at Low Temperatures. Glenn W. Geil, Nesbit L. Carwile, and Thomas G. Digges. *Journal of Research of the National Bureau of Standards*, v. 48, Mar. 1952, p. 193-200.

Charpy impact tests were made at temperatures ranging from −196 to +100° C. on fully hardened and tempered specimens of 0.3% carbon steels with variable N_2 contents. Al-treated steels had considerably lower transition temperatures than those of steels not treated with Al. Graphs. 38 ref. (Q23, CN)

539-Q. Hydrogen Embrittlement & Hair-Line Cracks in Steels. A. B. Chatterjea and B. R. Nijhawan. *Journal of Scientific & Industrial Research*, v. 11A, Apr. 1952, p. 158-161.

Literature review. 45 ref. (Q23, ST)

540-Q. A Calibrating Device for Impact Testing Machines. G. L. Brown. *Journal of Scientific Instruments*, v. 29, May 1952, p. 161. (Q6)

541-Q. The Influence of Copper, Nickel and Tin on the Hot Working Properties of Mild Steel. G. G. Foster and J. K. Gilchrist. *Metallurgia*, v. 45, May 1952, p. 225-230.

A study on the basis of bend tests carried out at high temperatures. Addition of Ni to Cu-bearing steels results in improved hot working properties, while the addition of Sn to Cu or Cu-Ni steels has the reverse effect. Graphs and photographs. 15 ref. (Q23, Q5, CN)

542-Q. The Development of a Strain or Displacement-Actuated Electronic Trigger for High-Temperature Stress-Relaxation Testing and Other Purposes. D. C. Herbert and D. J. Armstrong. *Metallurgia*, v. 45, May 1952, p. 267-270.

The servo system and its operating instructions. Schematic and wiring diagrams and photographs. (Q25)

543-Q. Influence of Heat-Treatment on the True Tensile Curves for Mild Steel. P. Bastien and C. Winter. *Metal Treatment and Drop Forging*, v. 19, May 1952, p. 213-216. (A translation.)

The effect of heat treatment on the plasticity modulus which characterizes the deep drawing quality of dead soft mild steel. The three steels used contained Ni in the range 0.15-0.17%; Cr, 0.08-0.11% and Cu, 0.15-0.30%. Tables and graphs. (Q27, G4, J general, AY)

544-Q. A Hardness Tester for Small Loads. H. Broschke. *Microtechnic* (English Ed.), v. 6, No. 1, 1952, p. 15-21. (Translated from the German.)

Apparatus known as the "Durimet" is primarily intended for testing very small parts as well as thin layers such as present on surface of case hardened workpieces, foil material, varnishes, plastics, edges and points of turning, milling, and other cutting tools. (Q29)

545-Q. Fatigue Strengths of 14S-T4 Aluminum Alloy Subjected to Biaxial Tensile Stresses. Joseph Marin and W. P. Hughes. *National Advisory Committee for Aeronautics,* Technical Note 2704, June 1952, 24 pages.

Effect upon fatigue strength of varying ratio of biaxial stresses was studied. The biaxial fatigue stresses were produced by applying simultaneously a pulsating internal pressure and a fluctuating axial tensile load to a thin-walled tubular specimen. Dynamic loads were applied by a specially designed testing machine. Results show that fatigue strength is greatly affected by anisotropy. (Q7, Al)

546-Q. Delayed Fracture of Metals Under Static Load. N. J. Petch and P. Stables. *Nature,* v. 169, May 17, 1952, p. 842-843.

Theory of the delayed fracture and its relationship to the same behavior of glass. Theory of hydrogen embrittlement and results of experiments on tensile strength and shock resistance of H_2-free and H_2-charged iron. (Q27, Q23, Fe)

547-Q. On the Significance of the Limit Load Theorems for an Elastic-Plastic Body. E. H. Lee. *Philosophical Magazine,* ser. 7, v. 43, May 1952, p. 549-560; disc., p. 560-561.

Theoretical and mathematical. Graphs. 11 ref. (Q21, Q23)

548-Q. The Elastic Behaviour of a Crystalline Aggregate. R. Hill. *Proceedings of the Physical Society,* v. 65, sec. A, May 1, 1952, p. 349-354.

Connection between the elastic behavior of an aggregate and a single crystal with special reference to theories of Voigt, Reuss, Huber, and Schmid. Elastic limit under various stress systems was also considered. Illustrated by data on Al, Cu, Au, and α-Fe. 10 ref. (Q21)

549-Q. A Study of Some Impacts Between Metal Bodies by a Piezo-Electric Method. A. W. Crook. *Proceedings of the Royal Society,* ser. A, v. 212, May 7, 1952, p. 377-390.

Continuous measurements of the force throughout impacts between metal cylinders and between a hard sphere and metal flats. The force was measured piezo-electrically. Results agree closely with force-time curves calculated, assuming that deformation is opposed by a constant pressure. Theory. Graphs and tables. 11 ref. (Q6)

550-Q. Nitrogen Content and Low-Temperature Brittleness of Steel. *Technical News Bulletin* (National Bureau of Standards) v. 36, Mar. 1952, p. 46-47.

See abstract of "Influence of Nitrogen on the Notch Toughness at Low Temperatures of Heat-Treated 0.3 Percent Carbon Steel", *Journal of Research of the National Bureau of Standards,* item 538-Q, above. (Q23, CN)

551-Q. F-3 Lead Alloy Cable Sheath —Effect of Bending and Creep on Life. L. F. Hickernell, A. A. Jones, and C. J. Snyder. *Transactions of the American Institute of Electrical Engineers,* v. 70, pt. 2, 1951, p. 1273-1280; disc., p. 1280-1285.

Extensive experimental investigation of mechanical properties of arsenical Pb alloy as compared with other cable-sheath alloys. Graphs, tables, and macrographs. (Q general, Q3, Q5, Pb)

552-Q. A Study of Cold Worked Aluminium by an X-Ray Micro-Beam Technique. (In English.) **I. Measurement of Particle Volume and Misorientations. II. Measurement of Shapes of Spots.** P. B. Hirsch and J. N. Kellar. **III. The Structure of Cold Worked Aluminium.** P. B. Hirsch. *Acta Crystallographica,* v. 5, Mar. 1952, p. 162-175.

X-ray, microbeam, back-reflection photographs permit determination of mean particle size and disorientation, and of their variations with degree of deformation, time after rolling, and purity of specimen. Part II: A method for obtaining, from the shapes of the spots on spotty-ring photographs, approximate values of physical broadening of the reflections. Part III: Results reported in the two previous installments are discussed in the light of present theories of plastic deformation of metals. 30 ref. (Q24, Al)

553-Q. Soap Film Technique for Solving Torsion Problems. (In English.) Ken Ikeda. *Japan Science Review,* v. 2, Aug. 1951, p. 113-118.

Technique for study of stresses in solids. (Q25)

554-Q. On the Estimation of Properties of Cast Iron by Chill Tests. (In English.) Nobuaki Ogura. *Japan Science Review,* v. 2, Aug. 1951, p. 203-210.

Small, sensitive wedge-shaped test pieces were used in the experiments. Quantitative relations among chill thickness of fracture, chemical composition, and tensile strength were investigated. By application of these comparatively small test pieces, estimation of properties is possible immediately after tapping. Results are charted, tabulated, and discussed. (Q27, E25, CI)

555-Q. The Influence of Gas in Steels. (In French.) A. Kohn. *L'Ossature Métallique,* v. 17, May 1952, p. 236-238.

A review on the basis of the literature, particularly effects on mechanical properties of basic bessemer steel with a low N content. Graphs. 16 ref. (Q general, CN)

556-Q. Large Mechanical Fatigue Test Installation (G.I.M.E.D.) of the Belgian Industrial Association (A.I.B.). (In French.) L. Baes and Y. Verwilst. *L'Ossature Métallique,* v. 17, May 1952, p. 267-276.

Reports on a series of fatigue tests done on large steel beams. Structural details of the equipment, such as its size, capacity, and various testing possibilities. (Q7)

557-Q. Susceptibility of High-Strength Structural Steels to Cracking and Brittle Fracture. (In German.) Erich Folkhard. *Schweissen und Schneiden,* v. 4, May 1952, p. 139-154.

See abstract from *Stahl und Eisen,* item 303-Q, 1951. (Q23, K9, CN)

558-Q. Significance of Wheatstone Bridges for the Measuring Process With Electrical Strain Gages Which Can Be Cemented Onto the Test Specimens. (In German.) A. U. Huggenberger. *Schweizer Archiv für Angewandte Wissenschaft und Technik,* v. 18, Apr. 1952, p. 105-116.

Varying arrangements on the test specimens. Examples of application. Data are extensively tabulated. 11 ref. (Q25)

559-Q. The Influence of Surface Films on the Friction of Solid Bodies. (In German.) F. P. Bowden. *Schweizer Archiv für Angewandte Wissenschaft und Technik,* v. 18, Apr. 1952, p. 116-127.

Recent investigations with respect to friction between metals. Effects of the mechanical properties of the oxide layers, of the lubricant film, and of attack by chemical agents. Tables and diagrams. 17 ref. (Q9)

560-Q. Contribution to Metallographic Investigation of the Hot Shortness of Corroded Platinum Ware. (In German.) Gerhard Neinacher. *Werkstoffe und Korrosion,* v. 3, May-June 1952, p. 192-197.

Polished sections of Pt ware, destroyed by pick-up of As, Bi, P or Si, were examined microscopically in a vacuum up to about 850° C. Eutectic melting processes, which cause the hot shortness, are clarified by the photomicrographs. (Q23, M27, Pt)

561-Q. Microhardness Investigations of Supersaturated Aluminum-Manganese Alloys. (In German.) Helmut Buckle. *Zeitschrift für Metallkunde,* v. 43, Mar. 1952, p. 82-89.

The straightline relationship between load and diameter of impression according to Meyer's exponential law applies only to highly pure metals and phases. A method of measuring the microhardness of the matrix is developed and applied to supersaturated solutions of Al-Mg alloys (3.0-6.7% Mg.) Graphs, tables, and micrographs. 12 ref. (Q29, Al)

562-Q. Theory of the Strength of Materials. (In German.) Kurt Matthaes. *Zeitschrift für Metallkunde,* v. 43, Jan. 1952, p. 11-19; Mar. 1952, p. 90-95.

Theory with particular regard to the elastic behavior of metals. The plastic state, the transition between elasticity and plasticity, and stress-corrosion. Data are tabulated and charted for a large number of pure metals and alloys. 63 ref. (Q21, Q23, R1)

563-Q. Mechanism of Tensile Deformation of Monocrystals. (In German.) Fritz Röhm and Jörg Diehl. *Zeitschrift für Metallkunde,* v. 43, Apr. 1952, p. 126-128.

Attempts to explain a sudden increase in strength properties of cubic-face-centered crystals at a certain point during plastic deformation. Behavior of high-purity Al reported previously is common to this type of crystals. 13 ref. (Q23, Q24, Al)

564-Q. Effect of Temperature and Rate of Deformation on Critical Shear Stress. (In German.) Franz Vitovec. *Zeitschrift für Metallkunde,* v. 43, Apr. 1952, p. 128-130.

Review of literature includes charted data for Sn, Cd, and Al. 14 ref. (Q2, Sn, Cd, Al)

565-Q. The Slip Process and Solidification of Metallic Substances. (In German.) A. Kochenderfer. *Zeitschrift des Vereines Deutscher Ingenieure,* v. 94, Apr. 1, 1952, p. 267-273.

Literature review. Discusses the process both in mono and polycrystals. Application of the results to technical problems. Schematic diagrams, tables, and graphs. 22 ref. (Q24, N12)

566-Q. Possibilities of Use of Continuous Testing Machines With Oscillating Drives. (In German.) Max Russenberger. *Zeitschrift des Vereines Deutscher Ingenieure,* v. 94, Apr. 21, 1952, p. 314-318.

A new type testing machine for investigating tensile stress, pressure, bending, and torsion stresses; it can also be used for determining damping, and for measurement of elasticity moduli. Examples illustrate its varied applications. Tables, graphs, diagrams, and photographs. (Q27, Q28, Q5)

567-Q. Thermal Fatigue of Aluminum Single Crystals. (In Russian.) V. I. Arkharov and A. K. Semenova. *Doklady Akademii Nauk SSSR,* new ser., v. 83, Apr. 11, 1952, p. 681-683.

Investigated by cycling specimens between 15° C. and 300, 400, and 500° C. for various lots. X-ray diffraction was used to study the deformations. Includes Laue patterns. (Q7, Al)

568-Q. The Theory of the Development of Twins in Metals, Alloys, and Laminated Crystals. (In Russian.) G. S. Zhdanov. *Doklady Akademii Nauk SSSR,* new ser., v. 83, Apr. 11, 1952, p. 685-688.

A theoretical discussion. 10 ref. (Q24, M27)

569-Q. The Hardness of Transition Zones in Unalloyed and Low-Alloy Steel and Possibilities of Predicting It. (In Swedish.) Tore Norén and Lauri Pietiläinen. *Esab's tidning Svetsaren,* v. 16, Apr. 1952, p. 71-90.

Effect of carbon content and heat treatment on hardness. Numerous graphs, photomicrographs, and tables. (Q29, CN, AY)

570-Q. Mechanical Testing of Solid Materials. Walter Ramberg. *Applied Mechanics Reviews,* v. 5, June 1952, p. 241-288.

A review. 117 ref. (Q general)

571-Q. A Discussion on Friction. *Proceedings of the Royal Society,* ser. A. v. 212, May 22, 1952, p. 439-520.

Includes introduction by F. P. Bowden, plus eight papers on friction of metals, four on friction of nonmetals, and five on boundary and e.p. lubrication, plus accompanying discussion. Selected papers are individually abstracted. (Q9)

572-Q. Influence of Oxide Films on Metallic Friction. R. Wilson. *Proceedings of the Royal Society,* ser. A, v. 212, May 22, 1952, p. 450-452; disc., p. 480-482.

Mechanism of metallic friction in air was investigated for loads ranging from 0.003 to 10,000 mg. The metals studied include Pt, Au, Ag, Cu, Sn, Pb, Zn, Cd, Mg, Al and Cr. Earlier work of Whitehead was extended and simultaneous measurements made of frictional force and the electrical resistance between the sliding surfaces. The results show that, with most metals, the natural oxide layer is sufficient to prevent metallic contact at very small loads. (Q9)

573-Q. Relation Between Friction and Hardness. A. J. W. Moore and W. J. McG. Tegart. *Proceedings of the Royal Society,* ser. A, v. 212, May 22, 1952, p. 452-458.

Experiments on a series of Cu-Be alloys show that friction decreases linearly with hardness. For a given load, amount of plastic deformation at points of intimate contact is greater for a soft metal. It is suggested that this deformation facilitates disruption of the oxide film so that, for softer metals, the proportion of oxide-free junctions is greater. The resulting frictional force is therefore higher. (Q9, Q29, Cu)

574-Q. Surface Changes Due to Sliding. G. I. Finch and R. T. Spurr. *Proceedings of the Royal Society,* ser. A, v. 212, May 22, 1952, p. 462-464; disc., p. 478.

Metallic bearing surfaces on sliding become coated with an amorphous Beilby layer formed by the smearing out of molten projections. The heating has been held to be due to friction between the metals themselves. However, there are many examples of formation of Beilby layers where there is no evidence of the occurrence of direct intermetallic contact and where the frictional forces must have been other than between metals. (Q9)

575-Q. Friction and Cohesion Between Single Crystals of Copper. A. T. Gwathmey, H. Leidheiser, Jr., and G. P. Smith. *Proceedings of the Royal Society,* ser. A, v. 212, May 22, 1952, p. 464-467.

Experiments were carried out between two large crystals of Cu of controlled orientation from the surface of which all oxide had been removed. One crystal was in the form of a sphere and the other a sphere with two flat surfaces parallel to particular planes. Coefficient of dry static friction between two (100) faces was greater than 100 and between (111) faces was approximately 25. The greater value for the (100) faces is attributed to greater digging-in and increased area of contact produced by slip as displacement occurs. (Q9, Cu)

576-Q. Wear Processes on Cemented Carbide Tools Used in Cutting Steel. E. M. Trent. *Proceedings of the Royal Society,* ser. A, v. 212, May 22, 1952, p. 467-470.

Examination of the worn top surface of tools of two types (tungsten carbide and cobalt, and tungsten carbide, titanium carbide and cobalt) showed that in cutting steel, an alloy is formed between the steel and the tungsten carbide at temperatures of about 1300° C., leading to very rapid wear. Consideration of phenomena of wear on such tools presents a picture of the type of temperature gradient in the tool near the friction surface. (Q9, C-n, ST)

577-Q. Metallic Wear. J. T. Burwell and C. D. Strang. *Proceedings of the Royal Society,* ser. A, v. 212, May 22, 1952, p. 470-477.

Experiments on wear between a cylindrical metal pin and a hardened steel disk. Under steady-state conditions at light loads, it was found that volume of material worn away is proportional to load, and to length of path traversed. Results are discussed in relation to the problem of running-in newly assembled machine parts. (Q9)

578-Q. Introduction to the Discussion: The Mechanism of Friction. F. P. Bowden. *Proceedings of the Royal Society,* ser. A, v. 212, May 22, 1952, p. 440-449; disc., p. 477-479.

The application of the electron microscope, and of metallurgical, interferometric and other physical methods, shows that even carefully polished or cleaved surfaces have irregularities on them which are large compared with molecular dimensions. Mechanism of the plastic-flow process was studied by optical and metallurgical methods and by use of artificially radioactive metals. Effects of oxide film strength and nature of adhesion between metals. (Q9)

579-Q. Notes on the Adhesion of Indium in Impact. A. W. Crook. *Proceedings of the Royal Society,* ser. A, v. 212, May 22, 1952, p. 482-483.

Investigation of adhesion of two surfaces of indium. Results are charted. (Q6, Q9, In)

580-Q. Comment on the Frictional Behaviour of Porous Metal Impregnated with P.T.F.E. P. P. Love. *Proceedings of the Royal Society,* ser. A, v. 212, May 22, 1952, p. 484.

"P.T.F.E." is polytetrafluoroethylene. Compares running tests on porous 89-11 Cu-Sn bearings impregnated with this compound and with oil. (Q9, Cu)

581-Q. Mechanism of Boundary Lubrication. D. Tabor. *Proceedings of the Royal Society,* ser. A, v. 212, May 22, 1952, p. 498-505; disc., p. 516.

How the theory of metallic friction is modified in the presence of boundary films. Minute metallic junctions contribute to the frictional resistance and play a major part in wear of lubricated surfaces. Effect of temperature shows that the most effective lubrication is provided by a solid boundary film which possesses a close-packed strongly oriented structure. A recent study of metal transference from one surface to the other as sliding takes place, using radioactive metals, shows that, at the melting-point of the lubricant film, a marked increase in pickup and friction occurs. At still higher temperatures, a second deterioration in lubricating properties occurs, corresponding to desorption of the lubricant film. (Q9)

582-Q. Effect of Surface Structure, Composition and Texture on Friction Under Boundary Conditions. F. T. Barwell. *Proceedings of the Royal Society,* ser. A, v. 212, May 22, 1952, p. 508-512.

Experiments wherein frictional behavior of surfaces of stainless steel specimens prepared in various ways was compared. Effect of different oxide films is best illustrated by reference to pure Al, the surface of which has been oxidized under different environmental conditions. (Q9)

583-Q. Mechanism of Action of Extreme Pressure Lubricants. C. G. Williams. *Proceedings of the Royal Society,* ser. A, v. 212, May 22, 1952, p. 512-515.

Variations among different metals, as well as among different e.p. lubricants. (Q9)

584-Q. Variation With Load of the Coefficient of Friction and Metallic Transfer Under Conditions of Boundary Lubrication. W. Hirst, M. Kerridge, and J. K. Lancaster. *Proceedings of the Royal Society,* ser. A, v. 212, May 22, 1952, p. 516-520.

Several papers published recently show for a number of metals that, under certain experimental conditions, several molecular layers of boundary lubricant are necessary to give effective lubrication. Recent experiments by the authors suggest that these results represent parts of a more general pattern. Graphs, macrographs, micrographs, and 82 ref. (Q9)

585-Q. Selecting Metals for Low Temperature Service. J. R. Watt. *Product Engineering,* v. 23, June 1952, p. 158-161.

Factors affecting impact strength at room temperature increase in importance at subzero temperatures. How grain size, carbon content, alloy content, heat treatment, and welding temperatures of steel affect transition temperature. Data for tin and solder, Zn-base alloys, wrought and ingot iron. (Q6, ST, Fe, Zn, Sn)

586-Q. Plating Effects Tested. *Steel,* v. 130, June 16, 1952, p. 104.

Brief report of effect of several Cr plating solutions on the fatigue strength of aircraft-quality SAE 4130 steel. Table. (Q7, L17, AY, Cr)

587-Q. What Can Be Learned From the Hardness Test? Part I. Howard E. Boyer. *Steel Processing,* v. 38, May 1952, p. 223-227.

Background information and principles primarily intended for operators of hardness testing equipment and for inspection supervisors. Part I: History and conventional methods. Photographs and diagrams. (To be continued.) (Q29)

588-Q. (Book) **Engineering Materials; Their Mechanical Properties and Applications.** Joseph Marin. 491 pages. 1952. Prentice-Hall, Inc., 70 Fifth Ave., New York 11, N. Y.

Part I: Mechanical properties of materials, their definition, determination, and utilization. Static, fatigue, impact, and high and low-temperature loading conditions such as tension, compression, bending, and torsion. Utilization of mechanical properties in simple machine and structural design problems. Part Two: Brief treatment of a number of important engineering materials. Emphasis is placed on mechanical properties and factors influencing them. Part Three: The more important testing machines and strain gages

used for determination of mechanical properties. Problems and references. (Q general)

589-Q. (Book) **Mechanics. Part I. Statics.** J. L. Meriam. 340 pages. 1952. John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y.

The first of two volumes covering basic engineering mechanics integrates the usual pre-engineering back-ground of physics, mathematics, and graphics. Progresses in easy stages from fundamentals to advanced theory; importance of principles and problems which apply them. 672 practical problems. Answers are given for more than half of these problems, and all are profusely illustrated. (Q general)

590-Q. (Book) **Strength of Metal Aircraft Elements.** Rev. Ed. 125 pages. June 1951. Subcommittee on Air Force-Navy-Civil Aircraft Design Criteria, Aircraft Committee, U. S. Munitions Board, Washington. (For sale by U. S. Govt. Printing Office, Washington, D. C.) 55c.

Chapter 1: Standard structural symbols, basic principles and definitions, types of failures, etc. The other four chapters cover general properties, columns, beams, torsion, combined loadings, joints, parts and fittings of steel, Al alloys, Mg alloys, and miscellaneous metals. (Q23)

R

CORROSION

263-R. Aluminum. R. L. Horst. *Chemical Engineering,* v. 59, May 1952, p. 300, 302, 304, 306, 308-310, 312-314, 316.

Corrosion resistance of aluminum and its alloys to more than 100 common corrosives—with data on applications, compositions, and mechanical properties. (R general, T general, Q general, Al)

264-R. Corrosion. Mars G. Fontana. *Industrial and Engineering Chemistry,* v. 44, May 1952, p. 103A-104A, 106A.

Several methods used in the literature for presenting or summarizing corrosion data. (R general)

265-R. On the Cubic Law of Oxidation. J. T. Weber. *Journal of Chemical Physics,* v. 20, Apr. 1952, p. 734-735.

Experimental and theoretical studies are reviewed including those on Fe and Cu. Data for Ta and Ti indicate that this growth law may apply to more metals than suspected in the past. Graphs. 11 ref. (R2, Ta, Ti, Fe, Cu)

266-R. Kinetics of Formation of Oxide Layer on Zinc. Walter J. Moore. *Journal of Chemical Physics,* v. 20, Apr. 1952, p. 764.

A theoretical discussion, with mention also of copper oxidation. (R2, Zn, Cu)

267-R. Precipitation of Colloidal Ferric Oxide by Corrosion Inhibitor Ions. W. D. Robertson. *Journal of Physical Chemistry,* v. 56, May 1952, p. 671-672.

The relative precipitating power with respect to a ferric oxide sol of anions employed as corrosion inhibitors was determined. Concludes that this power is not a significant factor in the corrosion-inhibition mechanism. (R10, Fe)

268-R. A Review of Information on the Effect of Impurities on the Corrosion Resistance of Aluminium. Part I. General Considerations. Part II. Aluminium. Part III. Wrought Alloys—Wrought Aluminium-Copper-Magnesium Alloys (Al-Cu-Mg). Part IV. Wrought Aluminium-Magnesium Alloys. Part V. Wrought Aluminium-Magnesium Silicide Alloys. Part VI. Wrought Aluminium-Manganese Alloys. Part VII. Wrought Aluminium-Zinc-Magnesium and Aluminium-Zinc-Magnesium-Copper Alloys. Part VIII. Cast Aluminium-Copper-Silicon and Aluminium-Magnesium Alloys. Part IX. Cast Aluminium-Silicon Alloys. Part X. Cast Aluminium-Zinc-Magnesium Alloys. Marjorie Whitaker. *Metal Industry,* v. 80, Mar. 7, 1952, p. 183-186; Mar. 14, 1952, p. 207-212; Mar. 21, 1952, p. 227-230; Mar. 28, 1952, p. 247-251; Apr. 4, 1952, p. 263-266; Apr. 11, 1952, p. 288-289; Apr. 18, 1952, p. 303-305, 313; Apr. 25, 1952, p. 331-332; May 2, 1952, p. 346-350; May 9, 1952, p. 387-388.

A comprehensive review. 175 ref. (R general, Al)

269-R. Cooling Water Treatment With Surface Active Materials. W. F. Oxford, Jr. *Petroleum Processing,* v. 7, May 1952, p. 620-622.

Experiences encountered in use of surface-active agents in preventing scale and corrosion in the circulating cooling-tower water of gas compressor plants. Includes weight-loss curves on soft-iron test strips. Tables and photographs. (R10, Fe)

270-R. Stop Tank Bottom Corrosion With Cathodic Protection. *Petroleum Processing,* v. 7, May 1952, p. 659, 661.

An example at a West Coast refinery, for protecting 12 large oil storage tanks. Diagram. (R10, CN)

271-R. What Can Be Done to Combat Corrosion of Refinery Tank Roofs? H. F. McConomy and J. J. Hur. *Petroleum Refiner,* v. 31, May 1952, p. 124-126.

A study made of various materials used to prolong the serviceable life of refinery tank roofs. (R3, ST)

272-R. The Truth About Fretting: Corrosion Problem Really Physical Change. *Steel,* v. 130, May 19, 1952, p. 103.

Experiments which show the physical nature of fretting, formerly considered as a corrosion problem. Any chemical reaction is secondary. Proper lubrication can ease the problem. Steel and Pt are mentioned. (R1, Q9, ST, Pt)

273-R. Weathering of Sheet-Metal Building Material. *Technical News Bulletin* (National Bureau of Standards), v. 36, May 1952, p. 72-74.

Two-year atmospheric exposure tests of a number of sheet metals used in building construction have recently been completed. Sheets of Al and Zn alloys and of Al-coated and galvanized steel were exposed to the weather. Each metal tested was fastened to bare wooden boards with nails of various materials, both with and without Neoprene or lead sealing washers between the nail head and the sheet. Results are summarized. (R3, Al, Zn, ST)

274-R. Potential and Passivity. (In French.) A. Rius and A. S. Terol. "International Committee on Electrochemical Thermodynamics and Kinetics; Proceedings of the 2nd Meeting" (Libreria Editrice Politecnica Cesare Taburini, Milan, Italy), 1951, p. 202-203; disc., p. 203-204.

The various concepts relative to passivity, electrode potential, and corrosion of Fe. Includes graphs. (R10)

275-R. Methods of Studying Corrosion Inhibitors and Activators. (In French.) L. Cavallaro and A. Indelli. "International Committee on Electrochemical Thermodynamics and Kinetics; Proceedings of the 2nd Meeting" (Libreria Editrice Politecnica Cesare Taburini, Milan, Italy), 1951, p. 205-217; disc., p. 218.

Mechanisms, methods for determining intensity of the protective and stimulating action, and methods of calculating their effects for practical usage. Includes tables. 37 ref. (R10)

276-R. Remarks on Corrosion and Passivation of Metals. (In French.) M. Pourbaix and P. Van Rysselberghe. "International Committee on Electrochemical Thermodynamics and Kinetics; Proceedings of the 2nd Meeting" (Libreria Editrice Politecnica Cesare Taburini, Milan, Italy). 1951, p. 219-229; disc., p. 230-231.

Behavior of soft steel in an aqueous bicarbonate solution; behavior of an 18-8 Cr-Ni steel in an acetic acid solution; and behavior of 18-8-2 Cr-Ni-Mo steel in an acetyl chloride solution. Schematic drawing, graphs, tables. (R10, CN)

277-R. An Example of Good Performance of Architectural Light-Metal Parts. (In German.) H. Neunzig. *Aluminum,* v. 28, May 1952, p. 150-152.

Signboard of anodized Al-Mn with letters of anodized Al-Mg-Si, exposed to a marine atmosphere for 14 years. Appearance of the latter was very satisfactory; that of the former, anodized in a thinner layer, was less satisfactory. (R3, L19, Al)

278-R. Irreversible Electrode Potentials of Iron in Electrolytes Containing Corrosion Inhibitors. (In Russian.) I. L. Rozenfel'd. *Izvestiia Akademii Nauk SSSR,* Section of Chemical Sciences, Nov.-Dec. 1951, p. 674-677.

A study was made of electrolytes containing sodium nitrite and zinc sulfate as inhibitors. Data are charted. (R10, P15, Fe)

279-R. Corrosion of Iron by Benzene Solutions of Iodine. (In Russian.) L. G. Gindin and M. V. Pavlova. *Zhurnal Prikladnoi Khimii,* v. 24, Nov. 1951, p. 1151-1155.

Laboratory tests; apparatus and method. It was found that FeI_2 is first formed and is then transformed to Fe_3O_4, liberating the iodine for further attack. Data are tabulated. (R6, Fe)

280-R. Oxidation of Alloys by the Wire Life Test Method. Anton deS. Brasunas and Herbert H. Uhlig. *ASTM Bulletin,* May 1952, p. 71-75.

Advantages, disadvantages, and results of method for rapid evaluation of alloys and various metal surface treatments for high-temperature oxidation. Wires were chiefly of Cr-Fe and Ni-Cr alloys. Tables, graphs, and photographs. (R2, Fe, Ni, SG-h)

281-R. Corrosion—Design It Out! R. B. Mears. *Canadian Metals,* v. 15, May 1952, p. 24, 26.

Causes, recommended design principles, selection of materials, and use of protective coatings. (R general, L general)

282-R. Condensed Phosphates and Corrosion Control. B. Raistrick. *Chemistry & Industry,* May 10, 1952, p. 408-414.

Discusses use of phosphate compounds for controlling corrosion of both ferrous and nonferrous metals. Mechanism of corrosion and of inhibitors; cathodic and anodic control with condensed phosphates; tuberculation, pitting, and successful use of metaphosphate at low pH, and role of Ca in corrosion control. Results of X-ray and optical studies of orientation of calcite on steel, and of anodic and cathodic effects, using two methods. 23 ref. (R10)

283-R. Gas Turbines. Part Two (b). I. G. Bowen. *Coke and Gas,* v. 14, May 1952, p. 161-166.

Fuels for the gas turbines with particular reference to solid fuels and gases. Corrosion problems and methods for overcoming them. Equipment diagrams, graph. (To be continued.) (R7, SS, Ni, SG-g, h)

284-R. Better Connector Life Vital to the Use of Aluminum in Distribution. C. E. Baugh. *Electrical World,* v. 137, June 2, 1952, p. 82-85.

Unsatisfactory performance of present connectors in rural areas removed from coastal contamination indicates the problem may be universal, with location affecting only the timing. Illustrations show corroded connectors. (R3, T1, Al)

285-R. Use of Magnesium Anodes in Cathodic Protection of Tanks and Pipelines. L. E. Magoffin. *Journal, American Water Works Association,* v. 44, May 1952, p. 407-412.

Experiences of California Water & Telephone Co. Although the overall cost is slightly higher than that of rectifier-type cathodic protection, ease of handling and adaptation more than offset additional cost. (R10, Mg, ST)

286-R. Corrosion and Cathodic Protection of Pipelines. W. R. Schneider. *Journal, American Water Works Association,* v. 44, May 1952, p. 413-426; disc., p. 427.

Confined to installations of continuous steel pipelines under water or in soil at normal soil temperature. Test procedures and protective methods (electrical or by use of graphite or Mg anodes.) (R10, ST)

287-R. Cathodic Protection of Steel Water Tanks. C. Kenyon Wells. *Journal, American Water Works Association,* v. 44, May 1952, p. 428-434.

Procedures and experiences of Long Beach Water Dept., Calif., indicate that cathodic protection of the interior surfaces of steel water-storage tanks is limited to those areas below the average highwater line. It still remains necessary to protect those areas above this level with some type of coating. Use limited to non-ice-forming months of the year. (R10, ST)

288-R. A Note on Filiform Corrosion. F. Hargreaves. *Journal of the Iron and Steel Institute,* v. 171, May 1952, p. 47-48.

Filiform type of corrosion was induced on polished carbon-steel specimens exposed to the atmosphere. Corrosion tracks, originating from slag inclusions, developed after 24 hr. exposure; they showed brilliant interference colors. Some filiform corrosion tracks also occurred on coated specimens. (R2, CN)

289-R. Correspondence on the Paper "Corrosion By Retained Treatment Chemicals on Phosphated Steel Surfaces", by S. G. Clarke and E. E. Longhurst. *Journal of the Iron and Steel Institute,* v. 171, May 1952, p. 58.

Discussion by R. J. Brown of above paper (Jan. issue), plus authors reply. See item 103-R, 1952. Illustrates "snail-trail" and filiform corrosion. (R6, L14, ST)

290-R. The Oxidation of Metals and Alloys. Erich Scheil. *National Advisory Committee for Aeronautics,* Technical Memorandum 1338, June 1952, 16 pages. (Translated from *Zeitschrift für Metallkunde,* v. 29, July 1937, p. 209-214.)

Mechanism of oxidation, citing evidence from the literature in verification of the theory postulated for oxidation and for formation of layers resistant to further oxidation. 29 ref. (R2)

291-R. Cathodic Protection of Buried Pipelines. K. A. Spencer. *Petroleum,* v. 15, May 1952, p. 121-123; June 1952, p. 149-153.

Part I: General survey. Part II: The type of survey that should be carried out before cathodic protection methods are applied to an existing pipeline. The protection equipment required. 13 ref. (R10, ST)

292-R. Protection of Electric Equipment Against Corrosion In Industrial Plants. Harold E. Springer. *Transactions of the American Institute of Electrical Engineers,* v. 70, pt. 2, 1951, p. 1605-1611; disc., p. 1611-1612.

See abstract from *Electrical Engineering,* item 440-R, 1951. (R10, T1)

293-R. Measuring Effectiveness of Rust-Preventive Oils. (In German.) Alexander Philippowich. *Erdöl und Kohle,* v. 5, Apr. 1952, p. 211-214.

Characteristics of the oils. Different methods of measuring rate of rusting of ferrous metals coated with different oils. Tables and graphs. (R10, Fe)

294-R. The Oxidation of Liquid Tin. (In German.) Wolfgang Gruhl and Ursula Gruhl. *Metall,* v. 6, Apr. 1952, p. 177-182.

Experiments made on pure Sn at temperatures of 325 and 600° C., and on Sn with up to 1% additions of Li, Na, Mg, Al, Zn, Cd, Sb, Pb, Bi, and Cu. The experimental results show that only those metal additions which are less noble than Sn, with the exception of Cd, speed up the oxidation. In the case of Al, even as slight an addition as 0.5% will completely inhibit the oxidation of Sn. Tables, charts and micrographs. (R2, Sn)

295-R. The Cathodic Protection Process and Its Application to Protection of Soil-Embedded Pipelines. (In German.) Heinrich Steinrath. *Metalloberfläche,* sec. A, v. 6, Apr. 1952, p. A49-A52. (R10, ST)

296-R. Effect of Sonic and Ultrasonic Vibrations on Electrochemical Processes. (In German.) Albert Roll. *Metalloberfläche,* Apr. 1952, sec. B, v. 4, p. B49-B53; May 1952, p. B65-B70.

Research shows that ultrasonics may prevent as well as increase passivity of surface coatings. The qualitative effect of weak ultrasound is similar to mechanical stirring. Intense ultrasound changes or destroys passivation by cavitation and impairment of passivating coatings. Part II: Effect of different factors on electrolytic separation of gases under influence of ultrasonics. Diagrams and graphs. 18 ref. (R10)

297-R. Resistance to Intergranular Corrosion of Ferritic and Martensitic Stainless Chromium Steels. (In German.) Eduard Houdremont and Walter Tofaute. *Stahl und Eisen,* v. 72, May 8, 1952, p. 539-545.

Investigation of stainless steels with 15-30% Cr with or without additions of Mo, Al, Si, P, Ti, Ta, Cl, and V regarding their tendency to intergranular corrosion, their hardness and structure. Carbide precipitation as a cause of intergranular corrosion. Modification of the theory of chromium impoverishment. Tables and graphs. (R2, SS)

298-R. Variation of Corrosion by Wetting Agents. III. Influence of the Constitution of Cation-Active Wetting Agents. Luigi Riatti. *Werkstoffe und Korrosion,* v. 3, May-June 1952, p. 186-188.

It was previously shown that the presence of wetting agents can prevent pitting action of tap water on unalloyed steel. An anion-active and several non-ionic wetting agents were found to be suitable. Two cation-active wetting agents examined under similar conditions gave, in one case, practically total protection of the steel; in the other, attack was stronger than by water without admixture. Both the products were derived from the same mono-acetylated diamine. Surface tensions were only slightly different. Since chemical constitution is apparently of decisive importance, use of only tested wetting agents is recommended. (R4, CN)

299-R. Definitions and Mechanism of Passivity. (In German.) Roberto Piontelli. *Werkstoffe und Korrosion,* v. 3, May-June 1952, p. 188-192.

Internal factors, initial surface state; conditions of environment; operative conditions; and specific properties of compounds which form protective layers. (R10)

300-R. Limits of Electrochemical Investigation of Corrosion Processes and Oxygen Contents. (In German.) Fritz Tödt. *Werkstoffe und Korrosion,* v. 3, May-June 1952, p. 205-209.

How initial corrosion can be used for determination of the oxide-film and local cell-effect between oxide and basic metal by colorimetric measurement of dissolved iron salts. Such measurements have a practical importance for timely recognition of corrosion danger in iron evaporators. A second more accurate method is sensitive to as low as 0.001% O_2. This process has proved satisfactory for determining very small quantities of O_2 in feed water of high-pressure plants. 11 ref. (R11)

301-R. Influence of Composition of Stainless Steel on Resistance to Sulfuric and Hydrochloric Acids. (In German.) Karl Bungardt and Hans Joachim Rocha. *Werkstoffe und Korrosion,* v. 3, May-June 1952, p. 209-211.

Shows changes of corrosion resistance with composition by means of 2 and 3-dimensional graphs. Two groups are distinguished on the basis of passivity characteristics. (R5, SS)

302-R. Prediction of the Appearance of Rust Damage in Warm-Water Plants. (In German.) Günther Seelmeyer. *Werkstoffe und Korrosion,* v. 3, May-June 1952, p. 211-217.

Formation of internal corrosion and scaling in waterworks equipment does not depend—as generally assumed—entirely on chemical nature of the water. Effects of kind and quality of materials used and of construction and operation of the plants are also important. Attempts to clarify these factors and to give more exact definitions of the concepts of aggressive, scale-forming, and non-scale-forming waters. Tables. (R4)

303-R. The Interaction of Iron With Ozone. (In Russian.) R. Kh. Burshtein and N. A. Shumilova. *Doklady Akademii Nauk SSSR,* new ser., v. 83, Mar. 11, 1952, p. 251-252.

A study was made of the formation of oxide films on iron specimens by ozone. Data are tabulated and charted. (R2, Fe)

304-R. The Chromium Impoverishment of Grain Boundaries as a Cause of Intercrystalline Corrosion of Stainless Steel. (In Russian.) I. A. Levin. *Doklady Akademii Nauk SSSR,* new ser., v. 83, Apr. 11, 1952, p. 701-704.

Corrosion tests on low-carbon Fe-Cr alloys indicate that intercrystalline corrosion is not due to Cr impoverishment. Tables and graphs. (R2, SS)

305-R. The Engineering Aspects of Intimate Metallic Surfaces. H. E. Arblaster. *Australasian Engineer,* Mar. 7, 1952, p. 43-58.

Cavitation erosion, covering mechanism, effect of some variables, testing cavitation resistance; metallic wear, covering galling, scuffing, etc.; problems of metallic surfaces nominally at rest; problems of surfaces in motion; friction and frictional resistance of metals; lubrication by thin metallic films; surface films; boundary lubrication; extreme pressure lubricants; and fretting corrosion and variables affecting it. Tables and photographs. 34 ref. (R1, R2, Q9, SG-c)

306-R. Corrosion Problems in Ion Exchange Systems. J. F. Wilkes. *Corrosion* (News Section), v. 8, June 1952, p. 1-2.
(R5)

307-R. Isolation of Trolley Bus Negative Return to Prevent Stray Current Corrosion. L. Horvath, H. E. Nerhood, S. M. Seidman, and R. H. Travers. *Corrosion* (Technical Section), v. 8, June 1952, p. 205-211.

When a rail-transportation system is converted to trolley-bus operation, there is a tendency to continue the use of rails for negative return. In Akron and Youngstown the resultant problems, corrosion and otherwise, finally led to abandonment of rail return and isolation of the negative return from ground. (R10)

308-R. A Case History Involving Intergranular Failure of Stainless Steel Heater Tubes. G. A. Works. *Corrosion*, (Technical Section), v. 8, June 1952, p. 217-221.

Failure of a number of Type 316 stainless steel tubes in a fired heater at a phenol solvent treating plant after 10 years of service. Metallurgical investigations showed that carbide precipitation at the grain boundaries had occurred at about 750° F. Heat treatment was carried out on the uncracked tubes and they were re-installed in the heater. No further difficulty was encountered after 24 months. Photomicrographs. (R2, J23, SS)

309-R. Aluminum Conductor and Connectors. C. E. Baugh. *Edison Electric Institute Bulletin*, v. 20, June 1952, p. 185-188.

See abstract of "Better Connector Life Vital to the Use of Aluminum in Distribution", C. E. Baugh, *Electrical World*, v. 137, June 2, 1952, p. 82-85. (R, Al)

310-R. The Anodic Oxidation of Platinum at Very Low Current Density. S. E. S. El Wakkad and Sayeda H. Emara. *Journal of the Chemical Society*, Feb. 1952, p. 461-466.

Reaction is carried on in acid, neutral, and alkaline solutions by the direct potentiometric method, using a special cell and constant current unit. (R2, EG-c)

311-R. The Kinetics of the Dissolution of Zinc in Aqueous Iodine Solutions. Parts III and IV. A. C. Riddiford and L. L. Bircumshaw. *Journal of the Chemical Society*, Feb. 1952, p. 698-704.

Part III: Zn, Cu, amalgamated Cu, brass, Pb, and Ni were found to dissolve in aqueous iodine solutions at the same rate under the same experimental conditions. Observed rate of dissolution of Zn was independent of crystal face exposed to attack, but was a function of the rate of stirring. Results agree with Levich's theory. Part IV: Fluid flow. The reaction may be used to characterize fluid flow in other solid-liquid systems.
(R5, P13, Zn, Cu, Pb, Ni)

312-R. Passivity of Iron in Nitric Acid. Harry C. Gatos and Herbert H. Uhlig. *Journal of the Electrochemical Society*, v. 99, June 1952, p. 250-258.

Passivity of iron in HNO_3 was studied employing iron films evaporated on glass. Influence of pre-exposure to various types of environments on the precise amounts of iron dissolving in HNO_3 before passivation reaction practically ceases. 13 ref. (R10, Fe)

313-R. The Influence of Inhibitors on the Dissolution of Iron in Acid Solution. J. Else and H. Fischer. *Journal of the Electrochemical Society*, v. 99, June 1952, p. 259-266.

Results of experiments, showing differences in the mechanism of action of various types. Graphs and tables. (R10, Fe)

314-R. Aluminum Corrosion Prevention. Part 1. George W. Orton. *Light Metal Age*, v. 10, Apr. 1952, p. 10-11, 33.

Aspects of direct chemical attack. (To be continued.) (R1, Al)

315-R. Operations and Maintenance of Pipe Line Cathodic Protection Systems. Marshall E. Parker. *Petroleum Engineer*, v. 24, June 1952, p. D36, D38-D40, D42, D44.

Factors that make supervision necessary, and inspection methods for three basic types of cathodic protection systems. (R10)

316-R. Control of Corrosion in Locomotive Diesel Engines. A. C. Mengel. *Railway Mechanical and Electrical Engineer*, v. 126, June 1952, p. 65-68.

Illustrations show appearance of corroded diesel-engine cylinder liners. Application of four preventive measures: proper maintenance of SO_4-CO_3 ratio; maintenance of proper ratio of $NaNO_3$ to alkalinity in feedwater; use of steel of lower tensile strength in boiler construction, so that stresses at grain boundaries are lower; and adoption of the all-welded, stress-relieved boiler. Use of chromates in the cooling water is also discussed. (R10, ST)

317-R. The Prevention of Corrosion in Packaging. I. The Use of Sodium Benzoate as a Corrosion-Inhibitor in Wrappings. II. Temporary Protectives From Rubber Latex and Other Aqueous Dispersions. III. Vapour-Phase Inhibitors. E. G. Stroud and W. H. J. Vernon. *Journal of Applied Chemistry*, v. 2, Apr. 1952, p. 166-184.

Experimental work on corrosion prevention of mild steel, cast iron, and nonferrous metals using a variety of the materials and techniques indicated in the subtitles, and under a variety of conditions. 19 ref. (R10, L26)

318-R. (Pamphlet) Atmospheric Exposure Tests of Nailed Sheet Metal Building Materials. Theodore H. Orem. *National Bureau of Standards*, Building Materials and Structures Report 128, Mar. 28, 1952, 24 pages.

Tests of nailed metallic building sheets of Al, Al alloy, Al-coated steel, galvanized steel, and Zn alloy exposed for 2 years to the atmospheres of Washington, D. C., and Hampton Roads, Va. The tests indicate that improper installation practices can cause accelerated corrosion of such materials. Recommendations regarding installation procedures. Tables, micrographs, and macrographs.
(R3, K13, Al, ST, Zn)

S

INSPECTION AND CONTROL

268-S. Rapid Spectrophotometric Determination of Silicon and Manganese in Cast Iron. John R. Boyd. *Analytical Chemistry*, v. 24, May 1952, p. 805-807.

Determination of above elements in a single weighed sample in about ⅓ the time necessary by gravimetric and volumetric means. Accuracy compares favorably with former methods. The procedure is of value to cast iron foundries which have a high melting rate and where changes of composition might cause heavy losses if not quickly corrected. 21 ref. (S11, CI)

269-S. Fire Assay for Iridium. R. R. Barefoot and F. E. Beamish. *Analytical Chemistry*, v. 24, May 1952, p. 840-844.

Significant losses of Ir to basic slags were noted, although satisfactory collections of Ir could be made when neutral or acid slags were used. Two methods for analysis of Pb-Ir buttons are outlined. Losses of Ir during cupellation were confirmed. A detailed examination of efficiency of a fire assay for extraction of Ir from ores; sources of error. 21 ref. (S11, Ir, Pb)

270-S. Precision Determination of Carbon in Metals by a High Frequency Combustion-Volumetric Method. Leonard P. Pepkowitz and Paul Chebiniak. *Analytical Chemistry*, v. 24, May 1952, p. 889-891.

Table shows accuracy and precision obtained with standard steels. Also applicable to other metals. (S11)

271-S. Spectrophotometric Study of Cadmium 1,10-Phenanthroline System. Coe Wadeline with M. G. Mellon. *Analytical Chemistry*, v. 24, May 1952, p. 894-896.

Study was made to determine the feasibility of using the system for determination of Cd. (S11, Cd)

272-S. Quantitative Spectrographic Analysis of Slags. W. J. Price. *British Cast Iron Research Association Journal of Research and Development*, v. 4, Apr. 1952, p. 315-335.

Method for the spectrographic analysis of slags which can be generally applied in routine analysis. All the metallic oxide constituents of a single slag may be estimated in about 2 hr. with an accuracy of 3%. Short survey of "rapid" slag-control methods and a review of spectrographic literature related to the problem, followed by a description of the work done in developing the recommended method. 39 ref. (S11, Fe)

273-S. Quality Control of Lead-Bronze Bearings. E. Uhlir. *Engineers' Digest*, v. 13, Apr. 1952, p. 117, 120. (Translated and condensed from *Machinenbau und Wärmewirtschaft*, v. 7, Jan. 1952, p. 4-8.)

Procedure for detecting defects in bearing lining which can be integrated easily in the production process. Instead of the usual hardness tesing and X-ray examination, a visual procedure was developed. Cutting speed during machining is merely reduced and tool angle set at 80°. The resulting surface shows all defects, even nonuniform Pb distribution. Casting problems. (S13, Cu, SG-c)

274-S. Instrumentation. Ralph H. Munch. *Industrial and Engineering Chemistry*, v. 44, May 1952, p. 97A-98A, 100A.

The Magne-Probe for nondestructive testing of high-temperature alloy parts. Principle is that magnetic permeability indicates physical structure. (S13, SG-h)

275-S. Metallurgical Nickel Analysis. W. D. Mogerman. *Industrial and Engineering Chemistry*, v. 44, May 1952, p. 971-973.

Historical review of analytical difficulties that delayed general recognition of Cronstedt's discovery of ni. The methods most widely used in metallurgical laboratories for determining Ni in both small and large quantities. Some practical hints for eliminating certain sources of error in gravimetric work. (S11, Ni)

276-S. Resume of Thermocouple Checking Procedures. Henry C. Quigley. *Instruments*, v. 25, May 1952, p. 616-622; *I. S. A. Journal*, v. 8, May 1952, p. 51-57.

The procedures are of two general classifications; calibration by comparison with calibrated standards and calibration at fixed points.

Under the first classification are the methods of comparison in place, in tube and muffle furnaces, and in baths. Under the second are procedures utilizing freezing points, melting points, and boiling points. (S16)

277-S. Emission Spectroscopy in the Steel Industry. E. R. Vance. *Ohio Journal of Science,* v. 52, May 1952, p. 114-117.

Practice at Steel and Tube Division, Timken Roller Bearing Co., Canton, Ohio. (S11, ST)

278-S. Quality Control—You'll Need a System. C. W. Kennedy. *Steel,* v. 130, May 19, 1952, p. 90-92.

An example of quality control found effective by Pantex Mfg. Co., Pawtucket, R. I., in meeting military specifications. Charts. (S12)

279-S. Contribution to the Analytical and Experimental Study of the Variations of Temperatures of Electric Furnaces as a Function of Time and of Fuel Supplied. (In French.) M. Billy and J. Brefort. *Chaleur & Industrie,* v. 33, Apr. 1952, p. 98-106.

A theoretical study of the thermal characteristics of electrical furnaces. Includes charts. (S16)

280-S. Contribution to Spectrographic Examination of Metal Foil. (In German.) G. Rätze. *Aluminium,* v. 28, May 1952, p. 152.

Fabrication of electrodes by briquetting foil or strip. (S11, T5)

281-S. Standardization and Testing of Drawing Dies. (In German.) A. Pomp. *Schweitzer Archiv fur Angewandte Wissenschaft und Technik,* v. 18, Mar. 1952, p. 97-101.

Status in Germany. New processes and instruments for measuring the shape of the die hole. Diagrams, photographs, and graphs. 11 ref. (S22, F28)

282-S. Present Status of X-Ray and Gamma-Ray Testing of Materials. (In German.) Rudolf Berthold, Otto Vaupel, and Norbert von Wetterneck. *Stahl und Eisen,* v. 72, Apr. 24, 1952, p. 492-499; disc., p. 499-500.

Progress made in exposing films with portable X-ray equipment for 300 kv. with continuous-constant current voltage. Improving the quality of pictures by fine-grained X-ray films and lead amplifier foils. Gamma-ray radiators available. Diagram of exposure with possibility of detecting faults when exposing films with Co^{60} and Ir^{192} and comparison with X-ray pictures. Economic efficiency of film exposures with gamma-ray radiators. Protection against radiation when using gamma-ray radiators. Tables and graphs. (S13)

283-S. Ultrasonic Nondestructive Testing of Materials. (In German.) Josef Krautkrämer. *Werkstoffe und Korrosion,* v. 3, Apr. 1952, p. 125-128.

See abstract of "A New Ultrasonic Probing Apparatus, Its Practical Utilization", J. Krautkrämer and H. Krautkrämer, *Métaux: Corosion-Industries;* item 245-S, 1952. (E13)

284-S. Radioisotopes Add a New Dimension. Ralph Belcher. *Battelle Technical Review,* v. 1, May 1952, p. 52-53.

Miscellaneous applications as tracers, uses of radioactive fission products, radiography, and other production-control procedures. (S19)

285-S. Equipment for Non-Destructive Testing. G. Rigby. *Canadian Metals,* v. 15, May 1952, p. 22-23.

Various methods and their applications. (S13)

286-S. Tentative Specifications for Magnesium-Base Alloy Sand Castings. *Foundry,* v. 80, June 1952, p. 189-190.

Data sheet. ASTM designation is B80-51T. Covers chemical analysis and mechanical properties. (S22, Q general, Mg)

287-S. Methods of Rating Furnace Capacity in the Steel Industry. *Industrial Heating,* v. 19, May 1952, p. 845-846.

Recommendations by American Iron and Steel Institute. (S12, D general)

288-S. Through Hell in a Box. Michael Bozsin. *Instrumentation,* v. 6, 2nd qtr., 1952, p. 13-14.

Equipment which enables an instrument to ride through enameling furnaces during production runs in the determination of firing temperatures. (S16)

289-S. How to Analyze Tin-Bronze Alloys. C. Goldberg. *Iron Age,* v. 169, May 29, 1952, p. 86-87.

Recommended procedures for sampling and determination of Sn, Pb, Cu, Fe, Ni, Zn, P, Si, Al, and Mn. (S11, Cu)

290-S. Hydrogen; Determination in Liquid Steel. R. M. Cook and J. D. Hobson. *Iron & Steel,* v. 25, May 17, 1952, p. 239; disc., p. 261-264.

Previously abstracted under similar title from *Journal of the Iron and Steel Institute,* item 425-S, 1951. (S11, ST)

291-S. The Tucumcari Tank Failure. *Journal, American Water Works Association,* v. 44, May 1952, p. 435-440; disc., p. 441.

Report of New Mexico Society of Professional Engineers on disaster of Dec. 13, 1951. A poorly welded vertical butt joint between ½-in. shell plates is believed to have been responsible for the failure. Failure to follow AWWA specifications was also a contributory factor. (S21, K1, CN)

292-S. Use of Radioactive Isotopes in Industry. *Mining Journal,* v. 238, May 9, 1952, p. 473-474.

Applications in flotation, smelting, refining, wear, and plating studies. 13 ref. (S19, B14, D general, Q9, L17)

293-S. Selection of X-Ray Detectors for Automatic Inspection. J. E. Jacobs and A. L. Pace. *Non-Destructive Testing,* v. 10, Apr. 1952, p. 12-17.

Various methods, their advantages, disadvantages, and applications. 14 ref. (S13)

294-S. Multi-Directional Magnetic Particle Inspection. R. A. Peterson. *Non-Destructive Testing,* v. 10, Apr. 1952, p. 18-22.

Principles and practical application of procedure developed to locate simultaneously defects in any plane. Equipment and typical results. (S13)

295-S. Curved Crystal Developments in Ultrasonic Resonance Testing. C. R. Betz. *Non-Destructive Testing,* v. 10, Apr. 1952, p. 28-31.

Even where flat crystals give usable indications, greatly improved results are obtained by use of a crystal ground to fit the work. In particular, use of a curved crystal and suitable fixtures often makes rapid production inspection possible. (S13)

296-S. How to Reduce Fishing Jobs, Extend Life of Drill Strings. R. S. Martin. *Oil and Gas Journal,* v. 51, June 2, 1952, p. 97-101.

Systematic inspection system for drill pipe which has reduced fishing jobs 90%, while at the same time extending the life of the drill string as much as 100%. (S general, ST)

297-S. Purchasing Specs for Powder Metal Bearings Meet MPA-ASTM Standards. *Precision Metal Molding,* v. 10, June 1952, p. 30-32, 83-84.

Standards established by Engineering Standards Dept., International Business Machines Corp. Comparison with MPA-ASTM standards. Graphs. (S22)

298-S. Temperature Measurement in Flame-Hardening. *Railway Gazette,* v. 96, May 9, 1952, p. 520-521.

An automatic photocell device which compares radiation from a comparison filament and from the work surface. Used with a flame hardening machine, automatic control of the hardening temperature is obtained. (S16, J2)

299-S. The Matrix Micro-Maag as an Internal Gauging Standard. Max Maag. *Microtechnic* (English Ed.), v. 6, No. 1, 1952, p. 26-29. (Translated from the German.)

Internal micrometer—a 3-point-contact instrument for rapid and reliable internal measurements with an accuracy of 1μ. (S14)

300-S. Principles of the Magneto-Inductive Measurement of Non-Ferromagnetic Layers on Iron Bases, Especially With Varying Radiation of Curvature. (In German.) Paul Koch. *Metalloberfläche,* sec. A, v. 6, May 1952, p. A67-A70.

Accuracy of measuring layer thicknesses by this method requires consideration of curvature by adjusting the zero point of the measuring instrument to curvature of the uncoated part. Diagrams, tables, and graphs. (S14)

301-S. A Novel High Vacuum Furnace. E. J. Caule. *Canadian Journal of Technology,* v. 30, Apr. 1952, p. 63-65.

Suitable for high-temperature studies of small specimens of metal and other applications. Apparatus diagram. (S16)

302-S. Supersonic Testing of Rail Ends. C. J. Code. *Railway Engineering and Maintenance,* v. 48, June 1952, p. 570-571.

Expanding use and effectiveness of relatively new method. (S13, CN)

303-S. Ultrasonics. Inspection Applications Grow. Ralph H. Frank. *Steel,* v. 130, June 16, 1952, p. 99-102.

Brief general discussion and some examples, illustrated with diagrams. (S13)

304-S. Fixed Gage Standards and Practice. Part I. William H. Gourlie. *Tool Engineer,* v. 28, June 1952, p. 40-42, 71-72.

Includes tables of tolerances. (To be continued.) (S14)

305-S. (Book) **Bolt, Nut, and Rivet Standards.** 247 pages. Industrial Fasteners Institute, 3648 Euclid Ave., Cleveland 15, Ohio. $3.00.

Revision of the so-called "Red Book" (published in 1941). Accepted standards of nomenclature, dimensions, sizes, and other practices. (S22, K13)

306-S. (Book) **Industrial Process Control By Statistical Methods.** John D. Heide. 297 pages. 1952. McGraw-Hill Book Co., 330 W. 42nd St., New York 18, N. Y.

Practical manual for use of statistics to control the quality of industrial products during the manufacturing process. Statistical methods required and practical and technical problems of applying them to factory processes. Mathematics are kept as simple as possible. (S12)

307-S. (Book) **Deistvuiushchie Tekhnicheskie Usloviia na Produktsiiu Tsvestnoi Metallurgii.** (Technical Operating Conditions in Nonferrous Metallurgical Production.) Ed. 2. 490 pages. 1949. Government Scientific-Technical Publishing House for Literature on Ferrous and Nonferrous Metallurgy, Moscow, U.S.S.R.

Handbook of Soviet standards, specifications, and approved procedures for testing and inspection. Includes tables of compositions of standard alloys used in the U.S.S.R. (S22, EG-a)

308-S. (Book) **Migrogeometriia Obrabotannoi Metallicheskoi Poverkhnosti i Ee Izmereniia.** (Microgeometry of Machined Metallic Surface and Its Measurement.) V. A. Barun. 180 pages. 1948. Government Scientific-Technical

Publishing House for Machine-Industry Literature, Moscow and Leningrad, U.S.S.R.

The present status of measurement of surface finish of machined metallic surfaces and methods and devices for this purpose. Basic concepts; apparatus. The problem of standardization of surface quality. 24 ref. (S15)

T

APPLICATIONS OF METALS IN EQUIPMENT

292-T. Iron Atoms in the Service of the Electrical Engineer. Charles Goodeve. *Engineer,* v. 193, May 2, 1952, p. 599-600.

Extracts from Kelvin Lecture. Properties, fundamental aspects, such as atomic and crystal structure, and their effects on mechanical and physical properties, including corrosion, creep, high-temperature behavior, and magnetic properties. (T1, M25, Fe, ST, SG-h)

293-T. Titanium Takes the Test. William S. Cockerell. *Finish,* v. 9, June 1952, p. 19-21.

Research of Ryan Aeronautical on use of Ti sheet and on the adaptability of machines and procedures for forming stainless steel components to the forming of Ti parts. Evaluation of various annealing and heat treating procedures. Hot forming procedure. High-temperature properties. (T24, Ti, SG-h)

294-T. Corrosion-Resisting Nickel Alloys and Chemical Progress. W. Z. Friend and F. L. LaQue. *Industrial and Engineering Chemistry,* v. 44, May 1952, p. 965-971.

Summary of the corrosion resisting characteristics of the principal Ni-containing alloys. Specific applications in the manufacture of a number of chemical products, including products involving Cl, Br, Fl, and Hf; synthetic textiles such as viscose rayon, cellulose acetate rayon, and nylon; dyestuff manufacture and textile dyeing and finishing; synthetic plastics such as phenolics, alkyds, polystyrene, and organic chloride polymers; antibiotics such as penicillin, streptomycin, and chloromycetin; fatty-acid products; and corn products. 84 ref. (T29, R6, R7, Ni, SG-g)

295-T. Titanium Aircraft Engine Parts: an Analysis. H. H. Hanink. *Iron Age,* v. 169, May 15, 1952, p. 121-125.

See Abstract of "Titanium in Aero-Engine Construction," *Aeroplane;* item 273-T, 1952. (T24, Q general, Ti)

296-T. Reservoir Roof in Light Alloy. *Light Metals,* v. 15, May 1952, p. 175.

British all-welded, Al alloy, oil-tank roof. (T26, Al)

297-T. Pre-Plated Drawn Steel Wire Saves Scarce Metals. Herbert Kenmore. *Materials & Methods,* v. 35, May 1952, p. 96-98.

Steel wire plated with either Cu, brass, or Ni and then drawn to size is finding many uses in both industrial and consumer fields because of its ability to be formed without flaking of the coating. The process and typical applications. (T general, L17, ST, Cu, Ni)

298-T. Materials at Work. *Materials & Methods,* v. 35, May 1952, p. 108-111.

Includes die-cast carburetor body; rigidized-metal electronic cases; ductile-iron furnace doors; Inconel "X" brake springs; and brass high-frequency connectors. (T general)

299-T. How to Choose Spring Materials. (Concluded.) M. Gerard Fangemann. *Materials & Methods,* v. 35, May 1952, p. 112-116.

How the cost and performance of a spring depend on the material used, and how each material meets particular stress, accuracy, corrosion resistance, and shock resistance requirements. Table gives mechanical and physical properties, heat treatment, and uses of 12 common ferrous and nonferrous spring materials. (T7,Q general, R general, SG-b)

300-T. Aluminum Alloys: Automakers May Use More. J. H. Dunn and E. P. White. *Steel,* v. 130, May 19, 1952, p. 95-96, 98.

Processes and applications, including brazed Al castings, brazing Fe to Al, a clutch-housing die casting, alloy for radiators, and Al coatings including corrosion resistance aspects. (T21, K8, L18, Al, SG-f)

301-T. Stronger, Lighter Jets From Clad Metals. *Steel,* v. 130, May 19, 1952, p. 104.

Test applications of Rosslyn metal sheet (composite Cu-stainless steel) at Ryan Aeronautical Co., San Diego, for jet power plants and piston-type exhaust systems. (T25, Cu, SS)

302-T. Special Steels for Aircraft Turbines; Research and Production Activities in Sheffield. *Times Review of Industry,* v. 6, May 1952, p. 42, 45.

(T24, AY, SS, SG-h)

303-T. Valve Steels. (In English.) *Aciers fins et Speciaux Francais,* Mar. 1952, p. 60-63.

Compositions and properties. (T7, AY)

304-T. Hammer-Rod Steels. (In English.) *Aciers fins et Speciaux Francais,* Mar. 1952, p. 71-73.

Special low-alloy steels necessary for dropforging-hammer shafts. (T5, AY)

305-T. Modern Railway Track "French Style" and the Use of Special Steels. (In English.) *Aciers fins et Speciaux Francais,* Mar. 1952, p. 80-82.

Extent to which plain carbon steel and various low-alloy steels meet requirements. Recommends use of a Cr-Mn steel for tie plates and clamps. Mechanical properties. (T23, Q general, AY)

306-T. Brass Pieces or Pressure-Cast Zamak Pieces? (In French.) R. Grunberg. *Métallurgie et la Construction Méchanique,* v. 84, Mar. 1952, p. 225, 227, 229.

Relative economic and technical merits of the two materials for use in pressure-fed oil cans. (T10, Cu, Zn)

307-T. Present Possibilities of Metallic Construction for Frameworks of Buildings. (In French.) André Delcamp. *L'Ossature Métallique,* v. 17, Apr. 1952, p. 173-180.

Technical and economic advantages over cement for homes and low and tall buildings. Schematic diagrams and photographs. (T26)

308-T. Aluminum as a Material for Cable Armor. (In German.) H. J. Hilgendorff. *Aluminum,* v. 28, May 1952, p. 144-145.

Higher fatigue strength of Al as compared to Pb, and higher electrical conductivity, which is advantageous in high-frequency cables. (T1, P15, Q7, Al)

309-T. Application of Aluminum in Construction of Medium-Sized and Large Transformers. (In German.) J. Muller. *Aluminum,* v. 28, May 1952, p. 156-159.

Technical properties and economic factors of conventional transformers and those wound with Al. (T1, P15, Al)

310-T. Stability of Lead and Lead-Alloy Anodes During Electrolysis of Sulfate Solutions. (In Russian.) G. Z. Kir'iakov and V. V. Stender. *Zhurnal Prikladnoi Khimii,* v. 24, Dec. 1951, p. 1263-1273.

Numerous Pb alloys were evaluated as anodes. An alloy containing 98.68% Pb, 1.0% Ag, 0.3% Sn, and 0.02% Co showed the smallest weight loss. Effects of current density, temperature, and other factors were also investigated. Tables and graphs. 20 ref. (T29, P15, Pb)

311-T. Aluminum in Textile Industry. *Canadian Chemical Processing,* v. 36, May 1952, p. 84.

Applications based on the recent survey by the Aluminum Assoc. and the Textile Information Service. Use in spinning-frame parts, warp beams, and heddle frames. (T29, Al)

312-T. "Hot Copper Sandwich" May Increase Life Expectancy of Glass Machinery. *Ceramic Industry,* v. 58, June 1952, p. 94.

Physical and mechanical properties and possible uses of Rosslyn metal (stainless steel bonded to both sides of a Cu core) on lehrs, decorating kilns, and other high-temperature glass-processing machinery. (T29, SS, Cu)

313-T. Cemented Carbides Give Longer Life to Forming Tools, Molds. J. S. Leibson. *Ceramic Industry,* v. 58, June 1952, p. 100-101.

Use of carbides at General Electric Co.'s Porcelain Mfg. Div., for production of ceramic insulators. Used for lathe work; drilling, counterboring, and reaming; and mold work. They have eliminated an average of 11 of every 12 tool grinds. (T5, G17, C-n)

314-T. Etched Sheets Serve As Microwave Components. R. M. Barrett. *Electronics,* v. 25, June 1952, p. 114-118.

Flat-strip transmission system operates successfully above 1000 mc. The metal-and-plastic sandwiches can be produced at low cost by printed-circuit etching techniques, replacing heavy and costly hybrid junctions and other wave-guide components used in airborne radar and microwave-communication equipment. System using Alclad sheets. (T1, Al)

315-T. Thermal Aspects of Furnace Design. C. Hulse and R. J. Sarjant. *Journal of the Institute of Fuel,* v. 25, May 1952, p. 94-102.

Recent developments in applying the laws of heat transmission to furnaces, the problem being treated as one calling for simultaneous solution of equations covering the various factors in heat transmission. Attempts to determine relative magnitudes of heat transfer due to convection and to radiation. 40 ref. (T5)

316-T. Aluminum in Building. *Metallurgia,* v. 45, May 1952, p. 254-255.

A research institute canteen with light-alloy structural members; a primary school with a roof covering of very high purity Al. (T26, Al)

317-T. Aluminum vs. Copper. F. L. Church. *Modern Metals,* v. 8, May 1952, p. 25-28, 30-32.

The shift from Cu to Al in the electrical industry. Causes and some of the principal products in which Al is gaining. (T1, Al)

318-T. Titanium and the Air Force. J. N. Dick and James R. Coxey. *Modern Metals,* v. 8, May 1952, p. 35-36, 38-39.

Outlook for Ti, particularly in respect to certain fabrication difficulties, from the Air Force point of view. (T24, Ti)

319-T. Reflective Insulation. . .for Lower Fuel Costs. . .More Summer Comfort. . .Less Moisture Damage. *Modern Metals,* v. 8, May 1952, p. 40-42.

Alfol insulation made by Reflectal Corp., consists chiefly of Al foil. Different types of Alfol are designed for homes, offices, and factories. (T27, Al)

320-T. How Magnesium Lightens the Load of the Mission Priest. *Modern Metals,* v. 8, May 1952, p. 58-59.

A mission unit, consisting of a cross and corpus together with a suitable carrying trunk, is used by Catholic mission priests in their travels from one church to another. Generous use of Mg sheet and extrusions results in lighter, sturdier, more functional mission units. (T9, Mg)

321-T. The Most Exacting Kind of Mounting Alignment—for an Optical System—Accomplished by Die Casting. *Precision Metal Molding,* v. 10, June 1952, p. 26-27.

Use of Al in Kodaslide Table Viewer made by Eastman. (T9, Al)

322-T. How Chromium-Plated Aluminum Permanent Mold Castings Replace Melamine. *Precision Metal Molding,* v. 10, June 1952, p. 33.

Where exposure to heat is a condition of service, Majestic Mfg. Co., St. Louis, has replaced melamine handle brackets with Al permanent-mold castings on the oven of their coal-electric combination cooking range. (T10, Al)

323-T. Non-Standard Pinions by Powder Metallurgy Meet All Specs at Lower Cost. *Precision Metal Molding,* v. 10, June 1952, p. 34, 86.

Fe-Cu powder mixtures are sintered, carburized, and Parkerized, for use in rotary and stroke-type counters made by Durant Mfg. Co., Milwaukee. Atmospheric corrosion and wear resistance are superior to extruded brass or plated steel previously used. (T8, H general, Q9, R3, Fe, Cu)

324-T. Die-Casting—Quickest Way to a Complete Assembly. *Precision Metal Molding,* v. 10, June 1952, p. 36-37.

Use of Zn and Al die castings in diaphragm-type air compressor. Finish machining operations have been cut to a minimum by utilizing surface finish and dimensional accuracy inherent in die castings. (T27, Zn, Al)

325-T. Direct-Image Offset Plate. A. G. Fegert. *Printing Equipment Engineer,* v. 82, June 1952, p. 80, 106-109.

Plate was developed primarily for directory work. Al foil is laminated to moisture-proof tag stock. (T9, Al)

326-T. High-Temperature Pressure Piping. Eric A. Kerbey. *Tappi,* v. 35, May 1952, p. 203-208.

Summary of the various piping materials and recommendations for selection at various operating temperatures. Specifications, compositions. forming, welding, heat treatment, inspection, and availability. (T27, ST, SG-h)

327-T. Aluminum Parts Help Increase Production. *Textile Industries,* v. 116, Feb. 1952, p. 185, 187.

Use of Al in yarn preparation equipment, loom beam barrels, section spools for knitting machines, and loom lays and hand rails. (T29, Al)

328-T. Aluminum Foil Utilized in Fire Protective Clothing. *Textile Industries,* v. 116, May 1952, p. 114.

A new Swiss fabric, "Tempex", developed to protect against extreme heat. (T10, Al)

329-T. Bell System Cable Sheath Problems and Designs. F. W. Horn and R. B. Ramsey. *Transactions of the American Institute of Electrical Engineers,* v. 70, pt. 2, 1951, p. 1811-1816.

A general discussion. Mechanical, electrical, and corrosion problems. (T1, R3, Q general, P15)

330-T. Natural Draft and Forced Draft. (In French.) J. E. Lafon. *Métallurgie et la Construction Méchanique,* v. 84, Mar. 1952, p. 175, 177, 179, 181; Apr. 1952, p. 251, 253, 255.

Compares the two systems as applied to industrial furnaces, especially the regenerative type. Schematic diagrams illustrate principles. (T5)

331-T. Participation of Aluminum in a Great French Undertaking; Dredges, Draglines, and Cableways of the Donzere-Mondragon. (In French.) Jean Reinhold and Jean Blanchot. *Revue de l'Aluminium,* v. 29, Apr. 1952, p. 137-149.

Use of Al alloys in construction of Rhone by-pass canal in above district. (T4, Al)

332-T. Light Alloy Surveyor's Transits. (In French.) Bernard Mallet. *Revue de l'Aluminium,* v. 29, Apr. 1952, p. 150-151.

Use of gravity or pressure die castings for various parts. (T8, Al)

333-T. Mobile Prerefrigeration Equipment of the S.T.E.F. (In French.) Maurice Victor. *Revue de l'Aluminium,* v. 29, Apr. 1952, p. 166-169.

Use of Al alloys in railroad-car-mounted equipment which applies preliminary refrigeration to cars for transportation of perishables. (T23, Al)

334-T. Standardization of Heat Losses in Heating Systems. (In Russian.) E. P. Shubin and A. P. Safonov. *Za Ekonomiiu Topliva,* v. 9, Mar. 1952, p. 12-17.

A mathematical discussion. (T5)

335-T. Russian Tractors Show Sound Engineering. W. G. Patton. *Iron Age*, v. 169, June 5, 1952, p. 150-152. (Condensed from "Russ Packs Engineering Punch," J. M. Davies, *SAE Journal*, v. 60, June 1952, p. 17-21.

A report on Russian metalworking based on two captured Stalinetz 80 tractors. Heat treating, casting, and machining practices.

(T21, J general, E general, G17)

336-T. Aluminum Alloys in Civil Engineering Practice. Part 1. Introduction. S. K. Ghaswala. *Light Metal Age*, v. 10, Apr. 1952, p. 18-20, 22, 25.

A brief history and a description of general and architectural properties and uses. (To be continued.) (T4, Al)

337-T. Developments in Francis Turbines. *Mechanical Engineering*, v. 74, June 1952, p. 510-512.

Discussion, including author's reply, of paper of similar title by W. J. Rheingans (Mar. 1952 issue). See item 169-T, 1952.

(T25, R2, SS, CN, Al)

338-T. Light-Alloy Lighters for Royal Pakistan Navy. *Sheet Metal Industries*, v. 29, June 1952, p. 525-526.

Small cargo carriers resembling landing craft. (T22, Al)

V

MATERIALS
General Coverage of Specific Materials

108-V. New 17-7PH Stainless Working Techniques. Gilbert Close. *Aviation Age*, v. 17, May 1952, p. 49-53.

A precipitation hardening alloy developed primarily for sheet, strip, plate, and wire applications. It is available also in angles, bars and forging billets. Usually supplied in the annealed condition with an ultimate tensile strength ranging from 115-150,000 psi., a tensile yield strength of 35-55,000 psi., and an elongation of 20-40%. Offers corrosion resistance superior to that of any of the standard Cr stainless steels along with higher mechanical properties than any of the Cr-Ni types. (SS)

109-V. Cast Alloy Reference Sheet. N. S. Mott. *Chemical Engineering Progress* (Engineering Section), v. 48, May 1952, p. 266.

Emphasis is on chemical corrosion resistance of 65% Ni, 32% Cu (cast Monel) alloy. Mechanical and physical properties, machinability, heat treatment, weldability, and applications are also listed. (R general, Ni)

110-V. Developments in Nickel. O. B. J. Fraser. *Industrial and Engineering Chemistry*, v. 44, May 1952, p. 950-954.

Discovery of Ni, developments in its technology and utilization, and history of the metallurgy by which it has been won from its ores. Some physical data, statistical information to aid in defining the position of Ni in the world's affairs, and comments on the distribution of Ni minerals in the earth's crust and the locations of ore bodies, past and present. 11 ref. (B general, A4, Ni)

111-V. Titanium and Its Alloys. John L. Everhart. *Materials & Methods*, v. 35, May 1952, p. 117-132.

Special section covers engineering properties; forming and machining; characteristics; cleaning and finishing; heat treatment; present and future uses; and weldability. Tables, graphs, and illustrations. (Ti)

112-V. The Precious Metals. *Materials & Methods*, v. 35, May 1952, p. 133, 135.

Data sheets cover Au, Ag, Pt, Pd, Rh, Ru, Os, and Ir with respect to physical and mechanical properties, fabrication, corrosion resistance, available forms, and uses. (EG-c)

113-V. The Spring Steels, Their Development, Properties and Applications. (In German.) Sepp Ammareller. *Stahl und Eisen*, v. 72, Apr. 24, 1952, p. 475-488; disc., p. 488-489.

Results of scaling tests and alternating-stress tests. Effects of surface finish, corrosion, and cross section of specimen were studied. Manufacture, heat treatment, and applications of the springs. Graphs, diagrams, and tables. 30 ref. (T7, AY, SG-b)

114-V. What We Know About Titanium. P. G. DeHuff and W. S. Hazelton. *Aviation Week*, v. 56, June 2, 1952, p. 40-41, 44-46.

Brief discussion of Ti and its alloys in relation to use in the aircraft industry, giving data on mechanical properties, forging, machining, and welding.

(T24, Q general, F22, G17, K general, Ti)

115-V. Rare Earths Are Moving Into Industry. *Business Week*, May 31, 1952, p. 46, 50-51.

Improved properties obtained in numerous cases upon addition of rare earths to standard alloy and stainless steels. (EG-g, SS, AY)

116-V. Ductile Iron. Its Significance to the Foundry Industry. Albert P. Gagnebin. *Foundry*, v. 80, June 1952, p. 128-131, 226-230, 232-240.

Manufacture, properties, and ap-

(*Continued on p. 61*)

EMPLOYMENT SERVICE BUREAU

The Employment Service Bureau is operated as a service to members of the American Society for Metals and no charge is made for advertising insertions. The "Positions Wanted" column, however, is restricted to members in good standing of the A.S.M. Ads are limited to 50 words and only one insertion of any one ad. Address answers care of A.S.M., 7301 Euclid Ave., Cleveland 3, O., unless otherwise stated.

POSITIONS OPEN

East

METALLURGICAL ENGINEER, METALLOGRAPHER: Small established research organization. Background in metallurgical engineering, physics or physical chemistry desired. Run metallographic laboratory and darkroom. Operate high-vacuum and metal-spraying equipment. Opportunity for advancement to project leader. College degree desired but consideration given other qualifications and experience. New York metropolitan area. Box 7-5.

METALLURGISTS, JUNIOR, INTERMEDIATE, SENIOR: To participate in applied research in the field of high-temperature metallurgy. Creep, fatigue, lean alloy development, and metal-joining research are related problems. Salary $4000-8000. Western New York. Box 7-10.

STEEL SALESMAN: Nationally known steel distributor has opening in western New York for salesman, age 23-30, with some metallurgical experience or training. Sales, mill or heat treating experience helpful. Give qualifications, education, experience and enclose photograph. Box 7-15.

METALLURGICAL ENGINEER: To assist supervisor of machine metals laboratory. Mechanical testing, metallography, specification preparation, and report writing involved. Desire man with at least three years practical experience on laboratory and machine shop problems concerning materials and heat treatment correlated with design. Newark, N. J. location. Box 7-20.

INSTRUCTOR IN METALLURGY: At eastern university. Position combines teaching with research or opportunity to work for advanced degree. Box 7-25.

METALLURGIST: U. S. Civil Service Commission has announced positions in various Federal agencies in Washington, D. C. and vicinity. Salaries range from $3410-$10,800 a year. No written test required. Applicants must have college degree or appropriate experience, or a combination of four years of education and experience. Positions paying $4205 or above must have had professional experience in metallurgical field. Graduate study may be substituted for all or part of experience. Senior or graduate students may apply if they expect to complete course within six months. Application forms may be obtained from U. S. Civil Service Commission, Washington 25, D. C., and should be sent to Executive Secretary, Board of U. S. Civil Service Examiners, National Bureau of Standards, Washington 25, D. C.

BRASS MILL METALLURGIST: For New Jersey mill. Must be familiar with mill problems in casting and processing into sheet, strip, wire and rod. Submit qualifications. Box 7-30.

PHYSICAL METALLURGIST: Experienced in physical testing, elastic tensile, hardness, conductivity. Will cast experimental alloys in high-frequency furnace, process and collect physical data. Submit qualifications. Box 7-35.

STEEL FOUNDRY METALLURGIST: Well-established New Jersey foundry requires graduate metallurgist. A June graduate or one with one or two years experience desired. Advancement based on successful applicant's ability and initiative. Good working conditions. Box 7-40.

SALES REPRESENTATIVE: Heat treating equipment for New England area. Salary and expense basis. Metallurgical and commercial heat treat background desirable, plus some sales experience. Box 7-150.

ENGINEER: Sound, resourceful, experienced engineer to develop by both design and experimental evaluation new types of electric melting furnaces in which automatic mechanisms are a definite feature. Challenging, interesting work with excellent growth prospects. Western Pennsylvania location. Box 7-175.

Midwest

METALLURGIST: For exploratory research. Prefer man with one or two years experience. Borg-Warner Central Research Laboratory, 706 South 25th Ave., Bellwood, Ill.

PHYSICAL METALLURGIST: To teach physical metallurgy and general chemistry or foundry engineering. Salary depending on experience. Box 7-45.

METALLURGIST: With two to four years experience in metallography and physical testing, to take charge of department. B.S. degree minimum requirement. Should be interested in unusual techniques and analyses regarding the physical metallurgy of high-melting point metals and alloys. Box 7-50.

RESEARCH ASSOCIATE: Minimum requirement M.S. degree, Ph.D. preferred, in chemistry, metallurgy, or physics. Research in field of metallic diffusion and x-ray diffraction. One month vacation. Give full qualifications, references, and expected salary. Box 7-55.

METALLURGIST, JUNIOR METALLURGIST: Research for industrial furnace manufacturer. Box 7-60.

ENGINEER: For industrial furnace manufacturer. Box 7-65.

MECHANICAL or PHYSICAL METALLURGIST: For fabrication development and research on deformation process. Prefer man with three to six years experience in field. Submit resumé of background, experience and salary requirements. Cleveland location. Box 7-70.

METALLURGICAL, MECHANICAL or ELECTRICAL ENGINEER: Application of high-frequency vibrations (ultrasonics) to the melting and casting or refractory metals. Submit resumé of background and salary requirements. Cleveland location. Box 7-75.

METALLURGIST: Recent graduate with one or two years steel mill experience. Stainless and specialty experience desirable but not essential. Will handle development of alloys, physical testing, metallographic work, production trouble shooting, in leading automotive parts manufacturer. Send complete resume and picture. Box 7-155.

METALLURGIST: Familiar with test equipment to conduct research in ferrous metals and work on service failures. Ability to write reports is very essential. Write in detail. TAPCO Division, Thompson Products, Inc., Cleveland 17, Ohio.

POSITIONS WANTED

INDUCTION HEATING ENGINEER: Electrical engineer with ten years experience in all phases of induction heating and associated metallurgy. Familiar with both machine and radio frequencies, surface hardening, forging, brazing. Capable of developing new applications and designing equipment. Position desired with company extensively employing induction heating. Age 36, married, family. Box 7-80.

INDUCTION HEATING ENGINEER: Married, two children. Ten years experience in induction hardening and soldering with both MG sets and radio-frequency units. Engineering development and work handling design, electrical engineering and metallurgical background. Desires position supervising induction heating development work. Location immaterial. Now employed. Excellent references. Box 7-85.

HEAT TREAT SUPERVISOR: With 30 years diversified experience in the hardening of carbon and high speed steel tools, heat treating of automotive, diesel and aircraft parts including nitriding, carbonitriding and flame hardening. Age 56, married, excellent references. Location immaterial. Box 7-90.

EXECUTIVE METALLURGIST: Graduate metallurgical engineer. Nine years diversified experience, six as chief metallurgist and chief engineer. Has wide knowledge of fabrication, heat treatment and quality control of steels, nonferrous alloys, including light metals, powdered and precious metals. Two years with leading aircraft manufacturer. Some management and sales promotional experience. Box 7-95.

PRODUCTION METALLURGIST or MATERIALS ENGINEER: B.S. degree in metallurgical engineering. Two years experience in experimental flame and induction hardening, 3½ years experience in service failure analysis, ferrous and nonferrous material specification for ordnance automotive vehicles, salvage procedures and shop problems. Familiar with ordnance specifications. Age 38. Prefers Detroit location. Box 7-100.

METALLURGIST: M.S. degree, age 44. Diversified supervisory experience in ferrous and nonferrous metallurgy, development, production, process control, protective finishes. Presently plant metallurgist in charge of development and production laboratories for manufacturer of electrical appliances, combustion devices, and munition components. Desires position as metallurgist or sales metallurgist in Milwaukee area. Box 7-105.

REGISTERED PROFESSIONAL ENGINEER: Retired Navy captain. B.S., M.S. metallurgical engineering degrees. Age 49, married. Twenty-one years Navy experience in operation, maintenance, overhauling power plant machinery and materials, ordnance materials, manufacturing, inspection and testing. Three and one half years civilian technical services

New Haven 1952-53 Officers Elected

Newly Elected Officers of the New Haven Chapter Are Shown With Enoch C. Richardson, Outgoing Chairman, at the May Meeting. From left, they are: Earle W. Lovering, Seymour Mfg. Co., treasurer; Carl B. Christensen, Ready Tool Co., Chairman; Mr. Richardson; R. P. Nevers, American Brass Co., vice-chairman; and Roy C. Raymond, secretary.

A.S.M. Review of Metal Literature

(Continued from page 59)

plications; economic prospects. Tables, graphs, and photographs. 14 ref. (E general, A4, CI)

117-V. Extremely High Temperature Materials. Bernard P. Planner. *Western Metals,* v. 10, May 1952, p. 43-45.

Various properties; manufacturing techniques, especially that of powder metallurgy; applications; composition of ceramic-metal materials; and ceramic-coatings on metal. (H general, L27, SG-h)

118-V. Results of New Investigations in the Field of High-Melting Metallic Hard Materials: Carbides, Nitrides, Borides, and Silicides. (In German.) R. Kieffer and F. Benesovsky. *Metall,* v. 6, Apr. 1952, p. 171-176.

Methods of production, properties, systems, and technical applications on the basis of the literature. Tables and graphs. 51 ref. (C-n, SG-j)

119-V. Aluminium and Its Alloys. R. W. Berriman. *Australasian Engineer,* Mar. 7, 1952, p. 76-82.

Trends in the metallurgy of Al wrought and cast products. Compositions of the principal wrought and casting alloys, showing their relationship to general alloy characteristics. Phase relationships of alloying elements, and some properties of high-strength alloys, clad products, high-temperature alloys, and casting alloys. Thermal treatments. Graphs and tables. 20 ref. (Al, SG-h, f, k, c)

120-V. Guide for Selecting Tool Steels and Carbides. *Steel,* v. 130, June 16, 1952, p. S1-S32.

A directory listing more than 50 companies and their products. Includes index of materials by trade name and index of materials by companies. Latter gives primary application, type, analysis, quenching medium, machinability, and movement in hardening. (TS, C-n)

121-V. (Book) **Tool Steel Handbook.** 197 pages. 1951. Allegheny Ludlum Steel Corp., 2020 Oliver Bldg., Pittsburgh 22, Pa. Free.

Charts and tables give specific and comparative data on properties, analyses, and applications of this company's toolsteels. Descriptions of the important grades, and forms and finishes available. Heat treating and handling techniques and other useful reference material. (TS)

122-V. (Book) **Metallurgiia Legkikh Metallov.** (Metallurgy of Light Metals.) Ed. 3. A. I. Beliaev. 428 pages. 1949. Government Scientific-Technical Publishing House for Literature on Ferrous and Nonferrous Metallurgy, Moscow, U.S.S.R.

Extractive metallurgy of the most important light metals—Al, Mg, Be, Ca, Ba, and Li. Properties, fields of application, technology of production, and theoretical bases of production. Tables, graphs, and diagrams. 121 ref.
(C general, Al, Mg, Be, Ca, Ba, Li)

EMPLOYMENT SERVICE BUREAU (CONT.)

with company consulting, research, and advisory contracts. Desires full or part-time position as company representative in Washington, D. C. Box 7-110.

SALES ENGINEER: Graduate metallurgist, age 33, married. Five years successful sales experience ferrous and nonferrous alloys and specialties. Estimating, technical, and supervisory experience as foundry metallurgist. Desires to relocate in Rocky Mountain, San Francisco or Pacific Northwest areas immediately. Willing to travel. Prefer sales but will consider technical position. Box 7-115.

ENGINEER: B.Ch.E. degree, 11 years diversified research and development experience in welding, flame-cutting and related problems. Various flame-cutting studies (armor plate, stainless steels, fuel gases), intensive study of inert-gas-shielded metal arc welding of stainless and heat-resistant alloys, including corrosion studies. Age 38, married. Location immaterial. Box 7-120.

METALLURGICAL ENGINEER: Age 27, married, children, veteran. M.S. degree. Experienced in ferrous heat treatment, metallography and testing. Five years Navy experience in electronics and steam plants. Desires position in production, heat treatment or development with opportunity for future advancement. Michigan or Midwest preferred, but will consider any location. Box 7-125.

METALLURGIST: Married, 37 years old, two children. Interested in securing position with a future. Fourteen years experience in the heat treating field, ten as foreman. Box 7-130.

METALLURGIST: Age 35, M.S. degree. Fourteen years diversified experience in ferrous metallurgical research, seven years in supervisory capacity, in steel foundry and steel mill. Closely associated with research and development problems on acid and basic openhearths, corrosion of stainless steel, welding, and quality control. Desires position in supervisory capacity. Box 7-135.

METALLURGIST: Diversified experience in fabrication of copper-base alloys into sheet, wire, and tube. Industrial experience includes furnaces and instruments, laboratory supervision, quality control, mill problems, methods of production, and customer contacts. Presently employed as metallurgist. Location immaterial. Age 43, good references, immediate interview. Box 7-140.

METALLURGIST: B.S., M.S. degrees in mechanical engineering and metallurgical engineering. Age 42. Fifteen years in nonferrous metallurgy and foundry, directing research and control laboratories, pilot plant operations, foundry superintendent, and works manager. Active in technical societies. Desires administrative position requiring metallurgical or foundry experience. Midwest preferred. Box 7-160.

METALLURGICAL ENGINEER: Age 30, B.S. degree, executive caliber. Experience in heat treating, marine superintendent and port engineer, foreign, and shipping ores. Five years diversified supervision. Available immediately. Desires position in foreign department in technical contact or operation. Box 7-165.

METALLURGIST: Employed in engineering planning for 7½ years, heat treat supervision for 7 years. 35 years old, married, three children. Prefer Denver or western location. Box 7-170.

ADMINISTRATIVE METALLURGIST: Preferably in ferrous metallurgical research. Presently employed as supervisor of well-known research laboratory. Experience consists of 12 years in steel research and production, three years with ordnance plant. Specialist in alloy, tool, stainless and high-temperature alloys. Technical publications. Age 38, Married. Some graduate work. Box 7-180.

Pittsburgh Greets New Chairman

Max Lightner (Right), Manager of Research and Development, United States Steel Co., and 1951-52 Chairman of the Pittsburgh Chapter, Turns Over His Gavel to G.M. Snyder, Woodings-Verona Tool Works, Incoming Chairman

A.S.T.M Annual Meeting Stresses Materials Standards

At the 50th Anniversary Meeting of the American Society for Testing Materials, held in New York the week of June 22, 165 papers were presented in formal and informal technical sessions, and 70 reports from technical committees. The unusually strong technical program attracted 2606 engineers and materials men, plus a large number of men who attended sessions and visited the exhibits.

There were 450 meetings throughout the week, ranging in length from ½ hr. to 3 days.

As a result of recommendations in the committee reports, 75 new specifications and tests were approved for publication for the first time in the 1952 edition of book of A.S.T.M. Standards, now in preparation.

Retiring president of A.S.T.M., Truman S. Fuller, engineer in charge of works laboratory, General Electric Co., Schenectady, spoke on "Some Gratifying Results". He noted the growth of A.S.T.M. specifications, the first ten of which were issued in 1900, to the present figure of some 1900 comprising over 10,000 pages, and pointed out a shift in the ratio of the standards on metals to nonmetals.

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